PROJECT MANUAL

PHASE I
MYRTLE VILLAGE AFFORDABLE HOUSING
12 Curve Street, West Newton, MA 02465

OWNER / DEVELOPER
Myrtle Village LLC
21 Curve Street, West Newton, MA 02465

ARCHITECT
Angelo A. Kyriakides Architect, PC
P.O. Box 1068
Brockton, Massachusetts 02303-1068
Telephone (617) 413-4928

May 27, 2015
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END OF DOCUMENT
Myrtle Village LLC, the Awarding Authority, invites sealed Bids from General Contractors for the Myrtle Village Affordable Housing - Phase 1 project located at 12 Curve Street, West Newton, MA, in accordance with plans and specifications prepared by Angelo A. Kyriakides, Architect P.C., P.O. Box 1068, Brockton, MA 02301-1068.

This Project consists of, but is not necessarily limited to, the renovation and addition to an existing wood framed building to construct 3 living units.

The value of the Work is estimated to be between $475,000.00 - $550,000.00.

The Work of this Contract shall be substantially completed within one hundred eighty (180) calendar days from the date of the Notice to Proceed. The anticipated start date is 1 July 2015 and the substantial completion date is 30 January 2016.

Sealed Bids will be received at the office of the Purchasing Department, Room 201, Newton City Hall, 1000 Commonwealth Avenue, Newton, MA 02459, until 10:00 a.m. on Wednesday, 24 June 2015. If mailed, Bids shall be sent to the Purchasing Department, Room 201, Newton City Hall, 1000 Commonwealth Avenue, Newton, MA 02459, and must be received no later than the date and time indicated above.

Bidding Documents will be available online at www.newtonma.gov/bids or Bidding Documents may be obtained at the office of the Purchasing Department, Room 204, Newton City Hall, 1000 Commonwealth Avenue, Newton, MA 02459, any time after 10:00 a.m. on Wednesday, 27 May 2015. Bid Documents may also be obtained at the Pre-Bid Meeting on Wednesday, 10 June 2015. Bidding Documents picked up at the Newton Purchasing Department or at the Pre-Bid Meeting will require a refundable deposit in the amount of one hundred dollars ($100.00) per set in the form of a certified or cashier’s check payable to Myrtle Village LLC. The full amount of each deposit for up to two (2) sets of Bidding Documents per Bidder will be refunded to each Bidder returning complete sets of Bidding Documents (including Addenda if issued) to the Newton Purchasing Department, within thirty (30) days of receipt of the General Bids. Otherwise, the deposit shall become the property of the Myrtle Village LLC. Additional sets may be purchased for one hundred dollars ($100.00) per set. There will be no charge (deposit) for obtaining Bid Documents online.

Bidders shall be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

Bid security shall be submitted with each bid in the amount of five (5) percent of the bid amount in the form of a Bid Bond or a Certified Bank Check, made payable to Myrtle Village LLC. No bids may be withdrawn for a period of 60 days after opening of bids. The awarding authority/owner reserves the right to reject any and all bids and to waive informalities and irregularities that are deemed not to be in the best interests of the project.

Bidder Qualifications: Bidders shall be required to submit a detailed list of their qualifications for review and consideration. Qualifications shall include but not be limited to the following:

1. Bidder shall demonstrate they have successfully completed projects of similar scope and time requirements.
2. Bidder shall demonstrate a minimum of five (5) years experience in providing affordable housing for non-profit organizations or public agencies.

3. Bidder shall demonstrate they have available and employ a sufficient work force to undertake this Project and complete it within the prescribed time frame.

4. Bidder shall submit, as part of their qualifications, a detailed construction schedule for the Project enumerating the 180 day project time from the issuance of the “Notice to Proceed” by Owner to the issuance of a “Certificate of Occupancy” by the City of Newton.

5. Bidders shall provide a list of major trade sub-contractors they intend to use on this Project for review by Owner. Owner reserves the right to reject any sub-contractor deemed not qualified to perform the Work of this Contract.

6. Bidders shall provide a list of current on-going projects for which they presently have contracts with along with names and contact information of the owners/clients/architects. In addition to the current contracted list of projects, Bidders shall to provide a list projects they have under contract but have not yet started.

MANDATORY PRE-BID MEETING: INTERESTED BIDDERS SHALL ATTEND A MANDATORY PRE-BID MEETING TO BE HELD AT THE PROJECT SITE, 12 CURVE STREET, WEST NEWTON, MA ON WEDNESDAY, 10 JUNE 2015 AT 10:00 A.M. PROSPECTIVE BIDDERS ARE REQUIRED TO ATTEND.
1.1 PROJECT INFORMATION
   A. Notice to Bidders: Qualified bidders are invited to submit bids for Project as described in this Document according to the Instructions to Bidders.
   B. Project Identification: Myrtle Village Affordable Housing - Phase 1.
      1. Project Location: 12 Curve Street, West Newton, MA.
   C. Owner: Myrtle Village LLC, 21 Curve Street, West Newton, MA 02465.
   D. Architect: Angelo A. Kyriakides, Architect P.C., P.O. Box 1068, Brockton, MA 02301-1068.
   E. Project Description: Project consists of the renovation and addition to an existing wood framed building to construct 3 living units.
   F. Construction Contract: Bids will be received for the following Work:
      1. General Contract (all trades).

1.2 BID SUBMITTAL AND OPENING
   A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:
      1. Bid Date: Wednesday, 3 June 2015.
      2. Bid Time: 10:00 a.m., local time.
      3. Location: Purchasing Department, Room 204, Newton City Hall, 1000 Commonwealth Avenue, Newton, MA 02459.
   B. Bids will be thereafter privately opened.

1.3 BID SECURITY
   A. Bid security shall be submitted with each bid in the amount of 5 percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

1.4 PREBID CONFERENCE
   A. A prebid conference for all bidders will be held at the Project Site, 12 Curve Street, West Newton, MA on Wednesday, 20 May 2015 at 10:00 a.m., local time. Prospective bidders are requested to attend.
1.5 DOCUMENTS

A. Bidding Documents will be available online at www.newtonma.gov/bids or may be picked up at the office of the Purchasing Department, Room 204, Newton City Hall, 1000 Commonwealth Avenue, Newton, MA 02459, any time after 10:00 a.m. on Monday, 11 May 2015. There will be no charge (deposit) for obtaining Bidding Documents.

1.6 TIME OF COMPLETION

A. Bidders shall begin the Work on receipt of the Notice to Proceed and shall complete the Work within the Contract Time.

B. The Work of this Contract shall be substantially completed within one hundred eighty (180) calendar days from the date of the Notice to Proceed. The anticipated start date is 15 June 2015 and the substantial completion date is 15 December 2015.

1.7 BIDDER'S QUALIFICATIONS

A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

END OF DOCUMENT
DOCUMENT 00 2113

INSTRUCTIONS TO BIDDERS

To be considered, Bids must be made in accordance with these Instructions to Bidders.

ARTICLE 1 - DEFINITIONS

1.1 Bidding Documents include the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form and the proposed Contract Documents including all Addenda issued prior to receipt of Bids.

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

ARTICLE 2 - BIDDER'S REPRESENTATION

2.1 Each Bidder by making his Bid represents that he has read and understands the Bidding Documents.

2.2 Each Bidder by making his Bid represents that he has visited the Site and familiarized himself with the local conditions under which the Work is to be performed.

2.3 Contractors will not be given extra payments for conditions which can be determined by examining the Site and the Bidding Documents.

ARTICLE 3 - EXAMINATION OF BIDDING DOCUMENTS AND SITE

3.1 Each Bidder shall examine the Bidding Documents carefully and shall make written request to Architect for interpretation or correction of any ambiguity, inconsistency or error therein which he may discover. Such request must be received by Architect at least seven (7) working days prior to the date of receipt of Bids. Any interpretation or correction will be issued as an Addendum by Architect. Only a written interpretation or correction by Addendum shall be binding. No Bidder shall rely upon any interpretation or correction given by any other method.

3.2 Prior to the receipt of Bids, Addenda will be mailed or delivered to each person or firm recorded by Architect as having received the Bidding Documents and will be available for inspection wherever the Bidding Documents are kept available for that purpose. Addenda will be issued not later than three (3) working days prior to the date as fixed for opening of Bids. Failure of any Bidder to receive any such addenda or interpretation, shall not relieve any Bidder from any obligations under his Bid as submitted. All Addenda so issued shall become part of the Contract Documents.
ARTICLE 4 - PREPARATION OF BIDS

4.1 Bids shall be submitted in duplicate on the separate "Bid Forms" furnished with the Bidding Documents. The forms enclosed in the Project Manual shall not be extracted nor used. There will be no mailing of additional forms by Architect.

4.2 All blanks on the Bid Form shall be filled in by typewriter or ink. Bids shall be signed with name typed below signature. Where Bidder is a corporation, Bids must be signed with the legal name of the corporation followed by the name of the State of incorporation and the legal signature of an officer authorized to bind the corporation to a contract.

4.3 Where so indicated by the makeup of the Bid Forms, sums shall be expressed in both words and figures. In case of discrepancy between the two, the written words amount shall govern.

4.4 No interlineations, alterations, or erasures shall be made in the Bid Forms.

ARTICLE 5 - SUBMISSION OF BIDS

5.1 Each Bid shall be enclosed in a sealed envelope with the following plainly marked on the outside:

BID FOR MYRTLE VILLAGE AFFORDABLE HOUSING - PHASE 1

______________________________________________________________
(Bidder’s Name and Business Address)

5.2 The sealed envelope shall be enclosed in an outer sealed envelope and delivered as set forth in the Invitation to Bid.

5.3 Date and time for receipt of bids is set forth in the Invitation to Bid.

5.4 Timely delivery of a Bid at the location designated shall be the full responsibility of Bidders.

5.5 A Bid shall be invalid if it has not been deposited at the designated location prior to the time and date for receipt of Bids indicated in the Invitation to Bid, or prior to any extension thereof issued to Bidders.

ARTICLE 6 - PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

6.1 Furnish and pay for bonds covering faithful performance of the Contract and payment of all obligations arising thereunder. Furnish bonds in such form as Owner may prescribe and with a surety company acceptable to Owner and licensed to conduct business in the State where the Project is located. Bidder shall deliver said bonds to Owner not later than the date of execution of the Contract. Failure or neglecting to deliver said bonds, as specified, shall be considered as having abandoned the Contract and the Bidder’s Bid Security will be retained as liquidated damages.
6.2 Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his power-of-attorney indicating the monetary limit of such power.

ARTICLE 7 - ALTERNATES

7.1 No alternates nor qualifications shall be made on the Bid Forms except where specifically called for. The Bid price submitted on the Bid Forms shall be based upon the Bidding Documents as presented, including all addenda thereto.

7.2 Alternates not specifically called for will be considered only if listed on a separate sheet of paper along with the dollar amount to be deducted from the Bid price, and enclosed in the same envelope with the Bid.

ARTICLE 8 - SUBMITTALS

8.1 Bidder shall, within seven days of notification of selection for the award of a Contract for the Work, submit the following information to Architect:
   1. a designation of the Work to be performed by Bidder with his own forces;
   2. the proprietary names and the suppliers of principal items or systems of materials and equipment proposed for the Work;
   3. a list of names of Subcontractors or other persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

8.2 Bidder will be required to establish to the satisfaction of Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the work described in the Bidding Documents.

8.3 Prior to award of the Contract, Architect will notify Bidder in writing if either Owner or Architect, after due investigation, has reasonable objection to any such proposed person or entity. If Owner or Architect has reasonable objection to any such proposed person or entity, Bidder may, at his option, (1) withdraw his Bid, or (2) submit an acceptable substitute person or entity with an adjustment in his bid price to cover the difference in cost occasioned by such substitution. Owner may, at his discretion, accept the adjusted Bid price or he may disqualify Bidder. In the event of either withdrawal or disqualification under this Paragraph, Bid Security will not be forfeited, notwithstanding the provisions of Paragraph 9.3.

8.4 Persons and entities proposed by Bidder, and to whom Owner and Architect has made no reasonable objection under the provisions of Subparagraph 8.3, shall be used on the Work for which they were proposed and shall not be changed except with the written consent of Owner and Architect.

ARTICLE 9 - WITHDRAWAL OF BIDS

9.1 Any Bid may be withdrawn prior to the time designated for receipt of Bids on written or telegraphic request. Telegraphic withdrawal of Bids must be confirmed over the signature of Bidder by written notice postmarked on or before the date and time set for receipt of Bids.
9.2 Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids.

9.3 No Bid may be withdrawn or modified after the Bid opening except where the award of Contract has been delayed for sixty (60) days or more.

ARTICLE 10 - TIME FOR COMPLETION

10.1 Work shall commence at the time stated in the notice to Contractor to proceed and shall be substantially completed within the time set forth in the Invitation to Bid. Notice to proceed may be given to the Bidder on any date after Owner has executed a "Letter of Intent" to sign the Contract or after the Bidder has executed the Contract. Contractor shall furnish performance and payment bonds and insurance certificates before commencing the Work.

ARTICLE 11 - AWARD

11.1 Owner intends to award the Contract on the basis of the lowest responsible Bid. Contractor will be selected contingent upon the acceptability by Owner of Contractor's subcontractors.

ARTICLE 12 - EXECUTION OF CONTRACT

12.1 Owner reserves the right to reject any and all Bids when such is deemed by Owner to be in his best interest.

12.2 Each Bidder shall be prepared, if so requested by Owner, to present evidence of his experience, qualifications, and financial ability to carry out the terms of the Contract.

12.3 Notwithstanding any delay in the preparation and execution of the Agreement, each Bidder shall be prepared, upon written notice of Bid acceptance, or upon receipt of a "Letter of Intent" to sign the Contract, to commence work within seven (7) days following receipt of official written order by Owner to proceed, or on date stipulated in such order.

12.4 The accepted Bidder shall assist and cooperate with Owner in preparing the Agreement, and within three (3) days following its presentation shall execute the Agreement and return it to Owner.

END OF DOCUMENT
BID FORM

BID TO:
Myrtle Village LLC
c/o Purchasing Department
Room 204, Newton City Hall
1000 Commonwealth Ave., Newton, MA 02459

BID FOR:
Myrtle Village Affordable Housing - Phase 1
12 Curve Street
West Newton, MA

BID FROM: ____________________________________________________________

I have received the Bidding Documents titled "Project Manual for Myrtle Village Affordable Housing - Phase 1" and all the Drawings. I have also received Addenda Nos. ______________, and have included their provisions in my Bid. I have examined both the Bidding Documents and the Site and submit the following Bid:

AMOUNT: I will construct this project for the lump sum of

______________________________________________________________

______________________________________________________________ DOLLARS ($________________________)

(In Words)............................................................................................................................

(In Numerals)...........................................................................................................................

ALTERNATES: I will include the following Alternates, if accepted, in accordance with requirements specified in Section 012300 "Alternates," for the costs stated:

Alternate No. 1: Fiber-Cement Siding / Plastic Siding (SUBTRACT) $______________
Alternate No. 2: Fiber-Cement / Vinyl Cornerboards (SUBTRACT) $______________
Alternate No. 3: Wood Windows / Vinyl Windows (SUBTRACT) $______________
Alternate No. 4: Asphalt Shingles (SUBTRACT) $______________

TIME: I will substantially complete the Project within 180 calendar days of the Notice to Proceed.

TERMS: In submitting this Bid, I agree:
1. To hold my bid open for 60 days subsequent to the date of the Bid Opening.
2. To accept the provisions of the Instructions to Bidders regarding disposition of Bid Security.
3. To enter into and execute a Contract, if awarded on the basis of this bid, and to furnish all bonds and insurance required by the bidding documents.
4. To accomplish the Work in accordance with the Contract Documents.
5. To complete the Work by the time stipulated in the Agreement.

If awarded the Work, I propose to staff and manage the project in the following manner (please attach separate statement):

BID FORM
00 4113 -1
I have attached the required Bid Security to this Bid.

Date: _______________  Firm Name: __________________________________________

Signature: ____________________________________________

Typed: _____________________________________________

Title: _____________________________________________

(Seal if Corporation)
1.1 BID FORM SUPPLEMENT

A. A completed bid bond form is required to be attached to the Bid Form.

1.2 BID BOND FORM

A. AIA Document A310, "Bid Bond," is the recommended form for a bid bond. A bid bond acceptable to Owner, or other bid security as described in the Instructions to Bidders, is required to be attached to the Bid Form as a supplement.

B. Copies of AIA standard forms may be obtained from The American Institute of Architects; www.aia.org/contractdocs/purchase/index.htm; email: docspurchases@aia.org; telephone (800) 942-7732.
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1.1 AGREEMENT FORM

A. The Agreement Form for Project is AIA Document A105 - 207, "Standard Form of Agreement between Owner and Contractor for a Residential or Small Commercial Project" and is hereby incorporated into the Procurement and Contracting Requirements by reference.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.
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1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

A. The following form of Owner/Contractor Agreement shall be used for Project:
   1. AIA Document A105 - 207, "Standard Form of Agreement between Owner and Contractor for a Residential or Small Commercial Project."

1.2 ADMINISTRATIVE FORMS

A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.

B. Copies of AIA standard forms may be obtained from the American Institute of Architects; http://www.aia.org/contractdocs/purchase/index.htm; docspurchases@aia.org; (800) 942-7732.

C. Preconstruction Forms:
   1. Form of Performance Bond and Labor and Material Bond: Use form included in the Project Manual or AIA Document A312, "Performance Bond and Payment Bond."

D. Information and Modification Forms:
   1. Form for Requests for Information (RFIs): Use form included in the Project Manual.

E. Payment Forms:
   1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
   3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF DOCUMENT
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KNOW ALL MEN BY THESE PRESENTS: That we ____________________________, as Principal, a ____________________________ hereinafter called "Principal" and ____________________________ of ____________________, State of ________________, hereinafter called the "Surety", are held and firmly bound into Myrtle Village LLC, hereinafter called "Owner", in the penal sum of ____________________________ Dollars ($ _______________ ) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal entered into a certain contract with the Owner, dated the ________ day of ________________, 2015 a copy of which is hereto attached and made a part hereof for the construction of the Myrtle Village Affordable Housing - Phase 1 project, located at 12 Curve Street, West Newton, MA.

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, the Principal and Surety have hereto set their hands and seals this ________ day of ________________, 2015.

PRINCIPAL  SURETY

_________________________________  ______________________________________
(Name & Seal) (Attorney-in-Fact) (Seal)

(Title)

Attest: ____________________________  Attest: ____________________________

The rate for this bond is _____ % for the first $ ______________ and _____ % for the next $ ______.

The total premium for this bond is $ __________________.
## REQUEST FOR INTERPRETATION

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**Request:**

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Signed by: ________________                  Date: ________________

**Response:**

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<td>Proposed Substitution:</td>
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<td>History:</td>
<td>New product</td>
<td>2-5 years old</td>
<td>5-10 yrs old</td>
<td>More than 10 years old</td>
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<td>Differences between proposed substitution and specified product:</td>
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<td>□ Point-by-point comparative data attached - REQUIRED BY A/E</td>
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<td>Reason for not providing specified item:</td>
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<td>Proposed substitution affects other parts of Work:</td>
<td>No</td>
<td>Yes; explain</td>
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<td>Savings to Owner for accepting substitution:</td>
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<td>Proposed substitution changes Contract Time:</td>
<td>No</td>
<td>Yes</td>
<td>[Add]</td>
<td>[Deduct]</td>
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<td>Supporting Data Attached:</td>
<td>Drawings</td>
<td>Product Data</td>
<td>Samples</td>
<td>Tests</td>
<td>Reports</td>
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The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: ________________________________
Signed by: ________________________________
Firm: ________________________________
Address: ________________________________
Telephone: ________________________________
Attachments: ________________________________

A/E's REVIEW AND ACTION

- Substitution approved - Make submittals in accordance with Specification Section 01330.
- Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
- Substitution rejected - Use specified materials.
- Substitution Request received too late - Use specified materials.

Signed by: ________________________________ Date: ________________________________

Additional Comments: ________________________________

□ Contractor   □ Subcontractor   □ Supplier   □ Manufacturer   □ A/E   □
TAX EXEMPTION REQUIREMENTS

1.1 TAX EXEMPTION INFORMATION

A. Tax Exemption: Owner is exempt from payment of sales taxes on materials and products permanently incorporated into the Work.

B. Records: Provide Owner with one copy of each purchase order, invoice, and receipt which used Owner's tax exemption certificate number.

C. Certification Required: Upon Contract completion, provide a notarized certification to Owner stating that all purchases made under Owner's tax exemption certificate number were legitimate, for this Contract, and entitled to the exemption.

D. Penalties: Pay all penalties assessed by authorities having jurisdiction for Contractor's improper or illegal use of Owner's tax exemption certificate number.

END OF DOCUMENT
1.1 INSURANCE REQUIREMENTS, GENERAL

A. Insurance Limits: The insurance required shall be written for not less than the limits of liability required by law or the following limits, whichever is greater:

1.2 INSURANCE REQUIREMENTS

A. General Liability* Insurance:
1. Bodily Injury and Property Damage Combined Single Limit: $1,000,000.
2. Bodily Injury and Property Damage Annual Aggregate Limit: $3,000,000.
3. * General Liability insurance shall include coverage for the following:
   a. Comprehensive Form.
   c. Explosion, Collapse and Underground (XCU).
   d. Products/Completed Operations.
   e. Contractual Liability.
   f. Independent Contractors.
   g. Broad Form Property Damage.
   h. Personal Injury Including Libel and Slander Coverage.
   i. All applicable Broad Form CGL Endorsements.
4. Myrtle Village LLC shall be named as an “Additional Insured.”

B. Products And Completed Operations Insurance:
1. Products and Completed Operations shall be maintained for a minimum of three years after the completion of the project.
   a. Each Occurrence: $1,000,000.
   b. Aggregate: $3,000,000.
2. Myrtle Village LLC shall be named as an “Additional Insured.”

C. Environmental Coverage (contamination):
1. Each Occurrence: $1,000,000.
2. Aggregate: $3,000,000.
3. Myrtle Village LLC shall be named as an “Additional Insured.”

D. Automobile Liability Insurance (applicable for any contractor who has an operating exposure)**:
1. Bodily Injury Per Accident: $1,000,000.
2. Property Damage Per Accident: $1,000,000.
3. ** Provide coverage for all Owned, Non-Owned, Leased, Rented and Hired vehicles.
4. Myrtle Village LLC shall be named as an “Additional Insured.”

E. Excess Liability (Umbrella Coverage):
1. Each Occurrence: $5,000,000.
2. Aggregate: $5,000,000.
3. Myrtle Village LLC shall be named as an “Additional Insured”
F. Builder's Risk Insurance: Contractor shall provide "builder's risk" insurance as described in the General Conditions of the Contract for Construction and with limits equal to the full insurable completed value of the project until such time as Owner assumes full use and occupancy of the project. Builder's Risk insurance shall include "all risk" insurance for physical loss and damage including theft, vandalism, and malicious mischief. Builder's Risk insurance shall be amended to delete all endorsements and provisions relating to cancellation of the policy due to partial occupancy by Owner.

G. Property Coverage: Contractor shall provide property coverage for materials and supplies being transported by Contractor within 1,000 feet of the premises.

H. Exclusions: Owner's property insurance shall not cover tools, equipment, shoring, staging, forms, temporary buildings, or other property or equipment owned or rented by Contractor, its Subcontractors, nor any worker.

I. Named Insured: Each insurance policy and certificate of insurance provided by Contractor shall name Owner as an additional insured.

J. Notice of Policy Cancellation and Amendment: Each insurance policy and certificate of insurance provided by the Contractor shall contain a provision that the Owner shall be notified of cancellation or restrictive amendment at least thirty (30) days prior to the effective date of such cancellation or amendment.

K. Insurance Certificates: Contractor and all subcontractors who are required to provide insurance under this Contract shall provide accurate and bona fide "Certificates of Insurance" issued by a responsible agent of the insurance company.
   1. Certificate Content: Such Certificates of Insurance shall clearly indicate the insurance coverage provided including all riders and limits specified. Each Certificate of Insurance shall be accompanied by a sworn and duly notarized statement from the responsible agent of the insurance company issuing the Certificate clearly stating that all insurance specified and required by the Contract Documents is provided and in force, and also a clear statement of all exceptions and deviations, if any, from the Contract Document insurance requirements.
   2. Responsibility: The insurance agent issuing and authorizing the Certificate of Insurance shall be responsible and liable for the accuracy and validity of the Certificate of Insurance. Each insured party shall certify by sworn and duly notarized statement that the Certificates of Insurance issued for them are bona fide.
   3. Disclaimers Prohibited: Certificates of Insurance shall not contain any disclaimers such as: "This Certificate is issued as a matter of information only and confers no rights upon the certificate holder. This Certificate does not amend, extend, nor alter the coverage afforded by the policies listed below. Disclaimers are not acceptable.
   4. Certificates of Insurance Can Be Relied Upon: Parties receiving Certificates of Insurance shall be entitled to rely upon the Certificates of Insurance and shall have the right to claim the benefits and protection provided by the insurance as it applies to them.

END OF DOCUMENT
SECTION 01 1000

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Project information.
   2. Work covered by Contract Documents.
   3. Access to site.
   4. Coordination with occupants.
   5. Work restrictions.

B. Related Requirements:
   1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: Comprehensive Modernization of the Campello High-Rise, Accessibility Renovations And Conversions.
   1. Project Location: 1380 South Main Street, Brockton, MA.

B. Owner: Brockton Housing Authority, 45 Goddard Road, Brockton, MA 02301.
   1. Owner's Representative: Mr. Frank Hines.
   2. Telephone (508) 427-9111.

C. Architect: Angelo A. Kyriakides, Architect P.C., P.O. Box 1068, Brockton, MA 02303-1068. Telephone (617) 413-4928.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of the Project is defined by the Contract Documents and consists of, but is not limited to, the following:
   1. The modification of nine (9) existing 1-bedroom apartment units into barrier-free units, and the modification of three (3) kitchens in existing 1-bedroom accessible apartment units.

B. Type of Contract:
   1. Project will be constructed under a single prime contract.

1.4 ACCESS TO SITE

A. Contractor shall have limited use of Project site for construction operations as indicated 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.

1.5 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and existing buildings during entire construction period. 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.
   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 Owner and approval of authorities having jurisdiction.

1.6 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.
   1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 8 a.m. to 5 p.m., Monday through Friday, unless otherwise indicated.

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 Owner not less than two days in advance of proposed utility interruptions.
   2. Obtain Owner's 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 with Owner.
   1. Notify Owner not less than two days in advance of proposed disruptive operations.
   2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 250 feet of the building, entrances, operable windows, or outdoor-air intakes.

F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
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SECTION 01 2300

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for 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. Include a complete description of negotiated revisions to alternates.

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. 1: Fiber-Cement Siding / Plastic Siding.
   1. Base Bid: Include the fiber-cement siding and soffits as specified in Section 07 4646 "Fiber-Cement Siding."
   2. Alternate: Delete the fiber-cement siding and soffits as specified in Section 07 4646 "Fiber-Cement Siding" and substitute vinyl siding and soffits as specified in Section 07 4633 "Plastic Siding."

B. Alternate No. 2: Fiber-Cement Cornerboards / Plastic (Vinyl) Cornerboards.
   1. Base Bid: Include the fiber-cement cornerboards as specified in Section 07 4646 "Fiber-Cement Siding."
   2. Alternate: Delete the fiber-cement cornerboards as specified in Section 07 4646 "Fiber-Cement Siding" and substitute 6 inch vinyl cornerboards as specified in Section 07 4633 "Plastic Siding."

C. Alternate No. 3: Wood Windows / Vinyl Windows.
   1. Base Bid: Include the aluminum-clad wood windows as specified in Section 08 5200 "Wood Windows."
   2. Alternate: Delete the aluminum-clad wood windows as specified in Section 08 5200 "Wood Windows" and substitute the vinyl windows as specified in Section 08 5313 "Vinyl Windows."

D. Alternate No. 4: Laminated-Strip Asphalt Shingles / Three-Tab-Strip Asphalt Shingles.
   1. Base Bid: Include the laminated-strip asphalt shingles as specified in Section 07 3113 "Asphalt Shingles."
   2. Alternate: Delete the the laminated-strip asphalt shingles as specified in Section 07 3113 "Asphalt Shingles" and substitute the 3-tab-strip asphalt shingles as specified in Section 07 3113 "Asphalt Shingles."

END OF SECTION
SECTION 01 2500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 01 6000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   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 Contractor or Owner.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. 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.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. 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.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
   a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplementary Instructions for minor changes in the Work.
   b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

   A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

   A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

   A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Substitution request is fully documented and properly submitted.
   c. Requested substitution will not adversely affect Contractor's construction schedule.
   d. Requested substitution has received necessary approvals of authorities having jurisdiction.
   e. Requested substitution is compatible with other portions of the Work.
   f. Requested substitution has been coordinated with other portions of the Work.
   g. Requested substitution provides specified warranty.
   h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within 15 days after commencement of the Work. 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 has received necessary approvals of authorities having jurisdiction.
      g. Requested substitution is compatible with other portions of the Work.
      h. Requested substitution has been coordinated with other portions of the Work.
      i. Requested substitution provides specified warranty.
      j. 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)

END OF SECTION
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SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. 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 administrative and procedural requirements for handling and processing Contract modifications.

B. Related Requirements:
   1. Section 01 2500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

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, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost 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.
B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

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 Section 01 2500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.


1.5 ADMINISTRATIVE CHANGE ORDERS

A. Unit-Price Adjustment: See Section 01 2200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.6 CHANGE ORDER PROCEDURES


1.7 CONSTRUCTION CHANGE DIRECTIVE


1. Construction Change Directive contains a complete 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
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SECTION 01 2900
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. 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 administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 01 2600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 01 3200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

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.

1.4 SCHEDULE OF VALUES
A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
d. Contractor's name and address.

e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.


4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

6. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

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 Architect.

C. Application for Payment Forms: Use AIA Document G702 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. Architect will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.

   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.

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. Products list.
   5. Schedule of unit prices.
   6. Submittal schedule (preliminary if not final).
   7. List of Contractor's staff assignments.
   8. List of Contractor's principal consultants.
   11. Initial progress report.
   13. Certificates of insurance and insurance policies.
   15. Data needed to acquire Owner's insurance.

H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
   6. AIA Document G707, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final liquidated damages settlement statement.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. 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 administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Requests for Information (RFIs).
   3. Project meetings.

B. Related Requirements:
   1. Section 01 3200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   2. Section 01 7300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   3. Section 01 7700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

A. 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, and telephone number of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 GENERAL 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, that depend on each other for proper installation, connection, and operation.
   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, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Project closeout activities.

1.6 REQUESTS FOR INFORMATION (RFIs)

A. 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.
   1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. 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.


D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
   1. The following Contractor-generated RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for approval of Contractor's means and methods.
      d. Requests for coordination information already indicated in the Contract Documents.
      e. Requests for adjustments in the Contract Time or the Contract Sum.
      f. Requests for interpretation of Architect's actions on submittals.
      g. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of 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 Section 01 2600 "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were returned without action or withdrawn.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within five days if Contractor disagrees with response.
   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
   1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
   2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
   3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Conduct the conference to review responsibilities and personnel assignments.
   2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; 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.
   3. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Designation of key personnel and their duties.
      c. Lines of communications.
      d. Procedures for processing field decisions and Change Orders.
      e. Procedures for RFIs.
      f. Procedures for testing and inspecting.
      g. Procedures for processing Applications for Payment.
      h. Distribution of the Contract Documents.
      i. Submittal procedures.
      j. Use of the premises and existing building.
      k. Work restrictions.
      l. Working hours.
      m. Owner’s occupancy requirements.
      n. Responsibility for temporary facilities and controls.
      o. Procedures for moisture and mold control.
      p. Procedures for disruptions and shutdowns.
      q. Construction waste management and recycling.
      r. Parking availability.
      s. Office, work, and storage areas.
      t. Equipment deliveries and priorities.
      u. First aid.
      w. Progress cleaning.
   4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at weekly intervals.
   1. Coordinate dates of meetings with preparation of payment requests.
   2. Attendees: In addition to representatives of Owner, 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.

3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      1) Review schedule for next period.
   b. Review present and future needs of each entity present, including the following:
      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Progress cleaning.
     10) Quality and work standards.
     11) Status of correction of deficient items.
     12) Field observations.
     13) Status of RFIs.
     14) Status of proposal requests.
     15) Pending changes.
     16) Status of Change Orders.
     17) Pending claims and disputes.
     18) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. 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 administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Contractor's construction schedule.
   2. Construction schedule updating reports.
   3. Daily construction reports.
   4. Site condition reports.
   5. Special reports.

B. Related Requirements:
   1. Section 01 3300 "Submittal Procedures" for submitting schedules and reports.
   2. Section 01 4000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
   2. Predecessor Activity: An activity that precedes another activity in the network.
   3. Successor Activity: An activity that follows another activity in the network.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:
   1. Two paper copies.

B. Contractor's Construction Schedule: Of size required to display entire schedule for entire construction period.

C. Construction Schedule Updating Reports: Submit with Applications for Payment.

D. Daily Construction Reports: Submit at weekly intervals.
E. Site Condition Reports: Submit at time of discovery of differing conditions.

F. Special Reports: Submit at time of unusual event.

1.5 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to the Contractor's construction schedule, including, but not limited to, the following:
   1. Discuss constraints, including Owner occupancy.
   2. Review submittal requirements and procedures.
   3. Review time required for review of submittals and resubmittals.
   4. Review requirements for tests and inspections by independent testing and inspecting agencies.
   5. Review time required for Project closeout.
   6. Review and finalize list of construction activities to be included in schedule.
   7. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from entities involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 5 days, unless specifically allowed by Architect.
   2. Submittal Review Time: Include review and resubmittal times indicated in Section 01 3300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
   3. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
   4. Punch List and Final Completion: Include not more than 5 days for completion of punch list items and final completion.
C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Work Restrictions: Show the effect of the following items on the schedule:
      a. Limitations of continued occupancies.
      b. Uninterruptible services.
      c. Use of premises restrictions.
      d. Seasonal variations.
      e. Environmental control.

D. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
   1. See Section 01 2900 "Payment Procedures" for cost reporting and payment procedures.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 15 days of date established for commencement of the Work. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

2.3 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
   1. List of subcontractors at Project site.
   2. Approximate count of personnel at Project site.
   3. Equipment at Project site.
   5. High and low temperatures and general weather conditions, including presence of rain or snow.
   6. Accidents.
   7. Meetings and significant decisions.
   8. Unusual events (see special reports).
   9. Stoppages, delays, shortages, and losses.
   10. Emergency procedures.
   11. Orders and requests of authorities having jurisdiction.
   12. Change Orders received and implemented.
   13. Construction Change Directives received and implemented.
   14. Services connected and disconnected.
   15. Substantial Completions authorized.

B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
2.4  SPECIAL REPORTS

A. Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: 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. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1  CONTRACTOR’S CONSTRUCTION SCHEDULE

A. Contractor’s Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION
SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. 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 requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
   1. Section 01 2900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Section 01 3200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 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. Submit action submittals and informational submittals required under separate transmittals.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. 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.
   1. Review: Allow 5 days for initial review of each submittal.
   2. Resubmittal Review: Allow 5 days for review of each resubmittal.
C. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
   3. Include the following information for processing and recording action taken:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Name of subcontractor.
      f. Name of supplier.
      g. Name of manufacturer.
      h. Location(s) where product is to be installed, as appropriate.
      i. Other necessary identification.
   4. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.

D. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities.

E. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by Contract Documents.
   1. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect will return two copies.
   2. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
   3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. Submit Product Data in the following format:
a. Three paper copies of Product Data unless otherwise indicated. Architect will return two copies.

C. 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.
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 coordination requirements.
   e. Notation of dimensions established by field measurement.
   f. Relationship and attachment to adjoining construction clearly indicated.
   g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.
3. Submit Shop Drawings in the following format:
   a. Two opaque copies and one reproducible transparency of each submittal. Architect will retain one opaque copy; remainder will be returned.

D. Contractor's Construction Schedule: Comply with requirements specified in Section 01 3200 "Construction Progress Documentation."

E. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 2900 "Payment Procedures."

F. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000 "Quality Requirements."

G. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 "Closeout Procedures."

H. 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.

I. 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.

J. 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.
K. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

L. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

M. 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.

N. 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.

O. 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.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action 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. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 7700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

F. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION
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SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. 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 administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities. Requirements may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

D. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

H. 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.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. 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.

1.6 REPORTS AND DOCUMENTS

A. 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, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. 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, and telephone number 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 whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. 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, and telephone number 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 whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 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.

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, 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. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST’s National Voluntary Laboratory Accreditation Program.

F. 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.

G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   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. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall 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 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 inspecting 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. 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 Section 01 3300 "Submittal Procedures."

D. 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.

E. 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.

   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.
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 reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified 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 Section 01 7000 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "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."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. 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.

4. ACI - American Concrete Institute; (Formerly: ACI International); www.abma.com.
5. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
6. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AIA - American Institute of Architects (The); www.aia.org.
15. ASCE - American Society of Civil Engineers; www.asce.org.
17. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
26. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
27. CSI - Construction Specifications Institute (The); www.csinet.org.
28. DHI - Door and Hardware Institute; www.dhi.org.
REFERENCES

35. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
37. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
40. MCA - Metal Construction Association; www.metalconstruction.org.
42. MPI - Master Painters Institute; www.paintinfo.com.
43. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
46. NECA - National Electrical Contractors Association; www.necanet.org.
52. NLGA - National Lumber Grades Authority; www.nlga.org.
54. NRCA - National Roofing Contractors Association; www.nrca.net.
55. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
59. SDI - Steel Door Institute; www.steeldoor.org.
60. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
61. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
63. TPI - Turfgrass Producers International; www.turfgrasssod.org.
64. UL - Underwriters Laboratories Inc.; www.ul.com.
65. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
68. 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. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
5. CMR - Code of Massachusetts Regulations; Board of Building Regulations and Standards; www.state.ma.us/bbrs.

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 up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.

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. CMR - Code of Massachusetts Regulations; Board of Building Regulations and Standards (Massachusetts); www.state.ma.us/bbrs.
   a. 521 CMR - Massachusetts Architectural Access Board; www.state.ma.us/aab.
   b. 780 CMR - Massachusetts State Building Code; www.state.ma.us/bbrs.
   c. 780 CMR c 13 - Massachusetts Commercial Energy Code (780 CMR, Chapter 13); www.state.ma.us/bbrs.
4. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
5. DSCC - Defense Supply Center Columbus; (See FS).
6. FED-STD - Federal Standard; (See FS).
8. MILSPEC - Military Specification and Standards; (See DOD).

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. AAB - Massachusetts Architectural Access Board (521 CMR); www.state.ma.us/aab.
2. BBRS - Board of Building Regulations and Standards (Massachusetts); www.state.ma.us/bbrs.
3. CMR - Code of Massachusetts Regulations; Board of Building Regulations and Standards; www.state.ma.us/bbrs.
4. MHD - Massachusetts Highway Department; Massachusetts Department of Transportation; www.massdot.state.ma.us.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. 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 requirements for temporary utilities, support facilities, and security and protection facilities.
B. Related Requirements:
   1. Section 01 1000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES
A. Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
B. Water and Sewer 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 construction operations.
C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
C. Dust-Control Plan: Submit drawing and narrative that indicates the dust-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate.
1.5 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.

PART 2 - PRODUCTS (not used)

PART 3 - EXECUTION

3.1 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
   1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: 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.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and 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.

E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

F. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

3.2 SUPPORT FACILITIES INSTALLATION

A. 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.

B. Parking: Provide temporary parking for construction personnel off-site.

C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 7300 "Execution."

D. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
3.3 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.

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.
   1. Comply with work restrictions specified in Section 01 1000 "Summary."

C. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

D. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

3.4 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.

C. 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. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 7700 "Closeout Procedures."

END OF SECTION
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. 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 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.

B. Related Requirements:
   1. Section 01 4200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work. 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.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced.
   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 of approval or rejection of proposed comparable product request within 5 days of receipt of request.
      a. Form of Approval: As specified in Section 01 3300 "Submittal Procedures."
1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft 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 inspection 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.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
   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.

C. Submittal Time: Comply with requirements in Section 01 7700 "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.


5. 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.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: 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. Significant qualities include attributes such as performance, weight, size, durability, 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.

PART 3 - EXECUTION (Not Used)

END OF SECTION
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. General provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
   1. Installation of the Work.
   2. Cutting and patching.
   3. Progress cleaning.
   4. Protection of installed construction.
   5. Correction of the Work.

B. Related Requirements:
   1. Section 01 1000 "Summary" for limits on use of Project site.

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 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

B. 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. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. 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.

B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

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. 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 Section 01 3100 "Project Management and Coordination."

3.3 INSTALLATION

A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as 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. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.
3.4 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.

B. 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.

C. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 1000 "Summary."

D. 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.

E. 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.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   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.

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. 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 Section 01 5000 "Temporary Facilities and Controls."

F. 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.

G. 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.

H. 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.

3.6 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.

END OF SECTION
SECTION 01 7700
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. 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 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.

B. Related Requirements:
   1. Section 01 7300 "Execution" for progress cleaning of Project site.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For cleaning agents.

C. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
CLOSEOUT PROCEDURES

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
   1. Submit a final Application for Payment according to Section 01 2900 "Payment Procedures."
   2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Include the following information at the top of each page:
   a. Project name.
   b. Date.
   c. Name of Architect.
   d. Name of Contractor.
   e. Page number.

2. Submit list of incomplete items in the following format:
   a. Three paper copies. Architect will return two copies.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

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.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. 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 requesting 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 hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
g. Remove labels that are not permanent.
h. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 5000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes refinishing damaged surfaces and touching up with matching materials. Where damaged or worn items cannot be repaired or restored, provide replacements. Restore damaged construction and permanent facilities used during construction to specified condition.

1. 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.

END OF SECTION
SECTION 02 4119
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.

B. Related Requirements:
   1. Section 01 7300 "Execution" for cutting and patching procedures.
   2. Section 31 1000 "Site Clearing" for site clearing and removal of above- and below-grade improvements not part of selective demolition.

1.3 DEFINITIONS
A. Remove: Detach items from existing construction and dispose of them off-site.

B. 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.

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 structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review areas where existing construction is to remain and requires protection.
1.6 INFORMATIONAL SUBMITTALS
   A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
   B. Qualification Data: For refrigerant recovery technician.
   C. Engineering Survey: Submit engineering survey of condition of building.
   D. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and for noise control. Indicate proposed locations and construction of barriers.
   E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.
   F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE
   A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS
   A. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
   B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
   C. 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.
   D. Storage or sale of removed items or materials on-site is not permitted.
   E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition 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 ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. 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.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

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 Be Removed: 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. 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. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

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. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 5000 "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. 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 fire watch during and for at least 12 hours after flame-cutting operations.
   7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   10. 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. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.
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.

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
SECTION 06 1000
ROUGH CARPENTRY

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. Framing with dimension lumber.
2. Framing with engineered wood products.
3. Wood blocking and nailers.
4. Plywood backing panels.

B. Related Requirements:
1. Section 06 1063 "Exterior Rough Carpentry."
2. Section 06 1533 "Wood Patio Decking" for elevated decks, including support framing.
3. Section 06 1600 "Sheathing" for sheathing, subflooring, and underlayment.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. 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.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:
1. Wood-preservative-treated wood.
2. Engineered wood products.
4. Post-installed anchors.
5. Metal framing anchors.

1.5 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 for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness unless otherwise indicated.

C. Engineered Wood Products: Acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
   1. Allowable design stresses, as published by manufacturer, shall meet or exceed those indicated. Manufacturer’s published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

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. Do not use inorganic boron (SBX) for sill plates.

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. Application: Treat items indicated on Drawings, and the following:
   1. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
   2. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
3. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
   1. Application: Interior partitions not indicated as load bearing.
   2. Species:
      a. Hem-fir (north); NLGA.
      b. Southern pine or mixed southern pine; SPIB.
      c. Spruce-pine-fir; NLGA.

B. Load-Bearing Partitions: No. 2 grade.
   2. Species:
      a. Hem-fir (north); NLGA.
      b. Southern pine; SPIB.

C. Ceiling Joists: Construction or No. 2 grade.
   1. Species:
      a. Hem-fir (north); NLGA.
      b. Southern pine or mixed southern pine; SPIB.
      c. Spruce-pine-fir; NLGA.

D. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade.
   1. Species:
      a. Hem-fir (north); NLGA.
      b. Southern pine; SPIB.

2.4 ENGINEERED WOOD PRODUCTS

A. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

B. Laminated-Veneer Lumber (LVL): Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
   1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal-depth members.
   2. Modulus of Elasticity, Edgewise: 1,800,000 psi.

C. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
   1. Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12-inch nominal-depth members.
   2. Modulus of Elasticity, Edgewise: 2,200,000 psi.
2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.

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.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 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 with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

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: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.8 METAL FRAMING ANCHORS

A. Allowable design loads, as published by manufacturer, shall meet or exceed those indicated. Manufacturer’s published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors shall be punched for fasteners adequate to withstand same loads as framing anchors.

   1. Use for interior locations unless otherwise indicated.
C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
   1. Use for wood-preservative-treated lumber and where indicated.

D. Joist Hangers: U-shaped joist hangers with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.
   1. Thickness: 0.062 inch.

E. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
   1. Strap Width: 2 inches.
   2. Thickness: 0.062 inch.

F. Bridging: Rigid, V-section, nailless type, 0.050 inch thick, length to suit joist size and spacing.

G. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.

H. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
   2. Thickness: 0.062 inch.
   3. Length: 24 inches.

I. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

J. Floor-to-Floor Ties: Flat straps, with holes for fasteners, for tying upper floor wall studs to band joists and lower floor studs, 1-1/4 inches wide by 0.050 inch thick by 36 inches long.

K. Hold-Downs: Brackets for bolting to wall studs and securing to foundation walls with anchor bolts or to other hold-downs with threaded rods and designed with first of two bolts placed seven bolt diameters from reinforced base.
   2. Width: 3-3/16 inches.
   3. Body Thickness: 0.138 inch.
   4. Base Reinforcement Thickness: 0.239 inch.

2.9 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
C. Water-Repellent Preservative: NWWDA-tested and accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. 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 nailers, blocking, and similar supports to comply with requirements for attaching other construction.

D. 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.

E. Install shear wall panels to comply with manufacturer's written instructions.

F. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

G. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

H. Do not splice structural members between supports unless otherwise indicated.

I. 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.

J. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
   1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
   2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
   3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
   4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
K. 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.

L. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

M. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

N. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   2. ICC-ES evaluation report for fastener.

O. 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 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for 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 wood blocking and nailers in walls and partitions for attaching equipment, cabinets and other Work, regardless of whether the item to be attached is provided under the Work of this Contract or is provided by Owner.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction unless otherwise indicated.
   1. For exterior walls, provide 2-by-6-inch nominal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
   2. For interior partitions and walls, provide 2-by-4-inch nominal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
   3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs.
C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
   1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
   2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated.

3.4 FLOOR JOIST FRAMING INSTALLATION

A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood. Attach floor joists as follows:
   1. Where supported on wood members, by using metal framing anchors.
   2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.

E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

F. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles and extending 4 inches beyond bend.

G. Provide solid blocking between joists under jamb studs for openings.

H. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
   1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

I. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
   1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal-size lumber, double-crossed and nailed at both ends to joists.
   2. Steel bridging installed to comply with bridging manufacturer’s written instructions.
3.5 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
   1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- size or 2-by-4-inch nominal- size stringers spaced 48 inches o.c. crosswise over main ceiling joists.

B. Rafters: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
   1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
   2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.

C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal- size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.6 STAIR FRAMING INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
   1. Size: 2-by-12-inch nominal size, minimum.
   3. Notching: Notch rough carriages to receive treads, risers, and supports; leave at least 3-1/2 inches of effective depth.
   4. Spacing: At least three framing members for each 36-inch clear width of stair.

B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

3.7 PLYWOOD BACKING PANEL INSTALLATION

   1. Fastening Methods:
      a. Screw to cold-formed metal framing.
      b. Space panels 1/8 inch apart at edges and ends.
3.8 PROTECTION

A. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet enough that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION
SECTION 06 1533

WOOD PATIO DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Plastic decking.
   2. Stairs for elevated decks.

B. Related Requirements:
   1. Section 07 2500 "Weather Barriers" for flexible flashing used with patio decking.
   2. Section 07 6200 "Sheet Metal Flashing and Trim" for sheet metal flashing used with patio decking.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For preservative-treated wood products, plastic decking and metal framing anchors.
   1. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
   2. For plastic decking and metal framing anchors include installation instructions.

C. Samples: For plastic decking, not less than 24 inches long, showing the range of variation to be expected in appearance of decking, including surface texture.

1.4 INFORMATIONAL SUBMITTALS

A. Material Certificates:
   1. For lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by ALSC's Board of Review.
   2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
B. Certificates of Inspection: Issued by lumber grading agency for exposed wood products not marked with grade stamp.

C. Evaluation Reports: For the following, from ICC-ES:
   1. Preservative-treated wood products.
   2. Plastic decking.
   3. Expansion anchors.
   4. Metal framing anchors.
   5. Decking fasteners.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials under cover and protected from weather and contact with damp or wet surfaces. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Handle and store plastic lumber to comply with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 LUMBER, GENERAL

A. Comply with DOC PS 20 and with grading rules of lumber grading agencies certified by ALSC's Board of Review as applicable. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by ALSC's Board of Review.
   1. Factory mark each item with grade stamp of grading agency.
   2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
   3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:
   1. Dimension Lumber: 19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness.

2.2 DIMENSION LUMBER FRAMING

A. Deck and Stair Framing: No. 2 grade and any of the following species:
   1. Hem-fir (North); NLGA.
   2. Southern pine; SPIB.
   3. Douglas fir-larch; WCLIB or WWPA.

B. Dimension Lumber Posts: No. 2 grade and any of the following species:
   1. Hem-fir or hem-fir (North); NLGA, WCLIB, or WWPA.
   2. Douglas fir-larch, Douglas fir-larch (North), or Douglas fir-south; NLGA, WCLIB, or WWPA.
   3. Mixed southern pine; SPIB.
2.3  PRESERVATIVE TREATMENT

A. Pressure treat boards and dimension lumber with waterborne preservative according to AWPA U1; Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

B. Pressure treat timber with waterborne preservative according to AWPA U1; Use Category UC4a.

C. Preservative Chemicals: Acceptable to authorities having jurisdiction.
   1. Do not use chemicals containing arsenic or chromium.

D. Use process for dimension lumber that does not include water repellents or other substances that might interfere with application of indicated finishes.

E. After treatment, redry dimension lumber to 19 percent maximum moisture content.

F. Mark treated wood with treatment quality mark of an inspection agency approved by ALSC's Board of Review.

G. Application: Treat all wood unless otherwise indicated.

2.4  PLASTIC DECKING

A. Plastic Lumber, General: Products acceptable to authorities having jurisdiction with current model code evaluation reports that show compliance with building code in effect for Project for indicated type of construction.
   1. Allowable loads and spans, as documented in evaluation reports or in information referenced in evaluation reports, shall not be less than design loads and spans indicated.

A. Composite Plastic Lumber: Solid shapes made from a mixture of cellulose fiber and polyethylene.
   1. Basis-of-Design Product: Trex Transcend by Trex Company, Inc., or a comparable product of one of the following:
      a. Certainteed Corporation.
      b. Correct Building Products, LLC.
      c. Fiber Composites, LLC.
      d. Louisiana-Pacific Corporation.
   2. Decking Size: 1-1/4 by 6 nominal, 1 by 5-1/2 inches actual.
   3. Configuration: Provide product with grooved edges designed for fastening with concealed clips.
   5. Color: As selected by Architect from manufacturer's full range.

2.5  FASTENERS

A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
1. Use stainless steel unless otherwise indicated.
2. For pressure-preservative-treated wood, use stainless-steel fasteners.
3. For plastic decking, use stainless-steel fasteners.

B. Nails: ASTM F 1667.

C. Power-Driven Fasteners: ICC-ES AC70.


E. Stainless-Steel Bolts: ASTM F 593, Alloy Group 1 or 2; with ASTM F 594, Alloy Group 1 or 2 hex nuts and, where indicated, flat washers.

F. Postinstalled Anchors: Stainless-steel, torque-controlled expansion anchors 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 according to ASTM E 488 conducted by a qualified independent testing and inspecting agency.
   1. Stainless-steel bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.6 METAL FRAMING ANCHORS

A. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated on Drawings. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Stainless-Steel Sheet: ASTM A 666, Type 304.

C. Joist Hangers: U-shaped, with 2-inch- long seat and 1-1/4-inch- wide nailing flanges at least 85 percent of joist depth.
   1. Thickness: 0.050 inch.

D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
   2. Thickness: 0.050 inch.

E. Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 1 inch above base and with 2-inch- minimum side cover, socket 0.062 inch thick, and standoff and adjustment plates 0.108 inch thick.

F. Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
   2. Thickness: 0.050 inch.
   3. Length: 16 inches.
2.7 CONCEALED DECKING FASTENERS

A. Deck Clips: Black-oxide-coated, stainless-steel clips designed to be fastened to deck framing with screws, and to secure decking material with teeth that also provide uniform spacing of decking material.

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. Tiger Claw Inc; Tiger Claw Hidden Deck Fasteners.

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 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime wood indicated to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Section 09 9100 "Painting."

3.3 INSTALLATION, GENERAL

A. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit work to other construction; scribe and cope as needed for accurate fit.

B. Framing Standard: Comply with AF&PA WCD1 unless otherwise indicated.

C. Install plastic lumber decking to comply with manufacturer's written instructions. Secure decking to framing with deck clips.

D. Install metal framing anchors to comply with manufacturer's written instructions.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

G. 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 members or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Apply copper naphthenate field treatment to comply with AWPA M4, to cut surfaces of preservative-treated lumber.
I. Securely attach exterior rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   1. ICC-ES AC70 for power-driven fasteners.

J. Use common wire nails unless otherwise indicated. Select fasteners of size that do not fully penetrate members where opposite side is exposed to view. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads unless otherwise indicated.

K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.

3.4 ELEVATED DECK JOIST FRAMING INSTALLATION

A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists where framed into wood supporting members by using wood ledgers as indicated or, if not indicated, by using metal joist hangers. Do not notch joists.

B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.

C. Lap members framing from opposite sides of beams or girders not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

D. Provide solid blocking of 2-inch nominal thickness by depth of joist at intervals of 96 inches o.c., between joists.

3.5 STAIR INSTALLATION

A. Provide stair framing members of size, space, and configuration indicated or, if not indicated, to comply with the following requirements:
   1. Stringer Size: 2 by 12 inches nominal, minimum.
   2. Stringer Spacing: At least three stringers for each 36-inch clear width of stair.

B. Provide stair framing with no more than 3/16-inch variation between adjacent treads and risers and no more than 3/8-inch variation between largest and smallest treads and risers within each flight.

C. Treads and Risers: Secure deck clips to carriages. Extend treads over carriages.

END OF SECTION
SECTION 06 1600

SHEATHING

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. Wall sheathing.
   2. Roof sheathing.
   3. Combination subfloor-underlayment.

B. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for plywood backing panels.
   2. Section 07 2500 "Weather Barriers" for water-resistive barrier applied over wall sheathing.
   3. Section 07 3113 "Asphalt Shingles" for sheet underlayment applied over roof sheathing.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 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 WOOD PANEL PRODUCTS

A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

B. Factory mark panels to indicate compliance with applicable standard.
2.2 WALL SHEATHING
   A. Plywood Sheathing: DOC PS 1, Exterior sheathing.

2.3 ROOF SHEATHING
   A. Plywood Sheathing: DOC PS 1 Exterior sheathing.

2.4 SUBFLOORING AND UNDERLAYMENT
   A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exterior, C-C Plugged single-floor panels.
      1. Nominal Thickness: As indicated on Drawings or, if not indicated, not less than 23/32 inch.
      2. Edge Detail: Tongue and groove.

2.5 FASTENERS
   A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
      1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
   B. Nails, Brads, and Staples: ASTM F 1667.
   C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL
   A. 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.
   B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
   C. Securely attach to substrate by fastening as indicated, complying with the following:
      1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
      2. ICC-ES evaluation report for fastener.
   D. 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.
E. Coordinate wall and roof 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.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. 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 WOOD STRUCTURAL PANEL INSTALLATION


B. Fastening Methods: Fasten panels as indicated below:
   1. Combination Subfloor-Underlayment:
      a. Glue and nail to wood framing.
      b. Space panels 1/8 inch apart at edges and ends.
   2. Wall and Roof Sheathing:
      a. Nail to wood framing.
      b. Space panels 1/8 inch apart at edges and ends.
      c. Install fasteners 3/8 inch to 1/2 inch from panel edges.
      d. Space fasteners in compliance with requirements of authority having jurisdiction.

END OF SECTION
SECTION 06 2013
EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exterior wood and cellular PVC trim.
   2. Window shutters.
   3. Gable louvers.
   4. Mail boxes.

B. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for furring, blocking, and other carpentry work not
      exposed to view and for framing exposed to view.
   2. Section 06 1533 "Wood Patio Decking" for elevated decks, including framing.
   3. Section 06 8200 "Glass-Fiber-Reinforced Plastic Fabrications" for exterior columns and
      railings.
   4. Section 07 4633 "Plastic Siding" for vinyl siding, vinyl soffit and vinyl trim.
   5. Section 07 4646 "Fiber-Cement Siding" for fiber-cement trim boards.
   6. Section 09 9100 "Painting" for priming and backpriming of exterior finish carpentry.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of process and factory-fabricated product. Indicate component
   materials, dimensions, profiles, textures, and colors and include construction and application
   details.
   1. Include data for wood-preservation 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. Include chemical-
      treatment manufacturer's written instructions for finishing treated material.
   2. For products receiving a waterborne treatment, include statement that moisture content of
      treated materials was reduced before shipment to Project site to levels specified.

C. Samples for Verification:
   1. For each species and cut of lumber and panel products, with half of exposed surface
      finished; 50 sq. in. for lumber and 8 by 10 inches for panels.
   2. For cellular PVC trim, with half of exposed surface finished; 50 sq. in.
   3. For window shutters, full size.
1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:
   1. For lumber that is not marked with grade stamp.
   2. For preservative-treated wood that is not marked with treatment-quality mark.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Cellular PVC trim.

C. Sample Warranties: For manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
   1. For exterior ornamental wood columns, comply with manufacturer's written instructions and warranty requirements.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.7 WARRANTY

A. Manufacturer's Warranty for Cellular PVC Trim: Manufacturer agrees to repair or replace trim that fails due to defects in manufacturing within specified warranty period. Failures include, but are not limited to, deterioration, delamination, and excessive swelling from moisture.
   1. Warranty Period: 25 years from date of Substantial Completion.

B. Manufacturer's Warranty for Window Shutters: Manufacturer agrees to repair or replace shutters that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Shutters: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated.
B. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
   1. For exposed lumber, mark grade stamp on end or back of each piece.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3a.
   1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
   2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
   4. Do not use material that is warped or does not comply with requirements for untreated material.
   5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee’s Board of Review.
   6. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
      a. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.
   7. Application: All exterior lumber and plywood.

2.3 EXTERIOR TRIM

A. Lumber Trim for Painted Finish:
   1. Species and Grade: Hem-fir, Prime or D finish; NLGA, WCLIB, or WWPA.
   2. Maximum Moisture Content: 19 percent.
   4. Face Surface: Surfaced (smooth).
   5. Factory Priming: Factory coated on faces and edges, with exterior primer compatible with topcoats specified.

B. Moldings for Painted Finish: MMPA WM 4, P-grade wood moldings. Made from kiln-dried stock to patterns included in MMPA’s "WM/Series Wood Moulding Patterns."
   1. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
   2. Finger Jointing: Allowed if made with wet-use adhesive complying with ASTM D 5572.
   3. Factory Priming: Factory coated on faces and edges, with exterior primer compatible with topcoats specified.

C. MDO Trim: Exterior Grade B-B MDO plywood.

D. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized rigid material.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following or equal:
      a. CertainTeed Corporation; CertainTeed Restoration Millwork.
      b. Vycom Corp.; Azek.
      c. Wolfpac Technologies, Inc.; Versatex.
2. Density: Not less than 31 lb/cu. ft.
3. Heat Deflection Temperature: Not less than 130 deg F, according to ASTM D 648.
4. Coefficient of Thermal Expansion: Not more than 4.5 x 10(-5) inches/inch x deg F.
5. Water Absorption: Not more than 1 percent, according to ASTM D 570.
6. Flame-Spread Index: 75 or less, according to ASTM E 84.

2.4 WINDOW SHUTTERS

A. Basis-of-Design Product: Mid-America Siding Components; Custom Open Louver Shutter.
   1. Model No. L2, straight top, center mullion.
   2. Width: 12 inches.
   3. Length: To match window heights
   4. Color: As selected by Architect from manufacturer's full range.
   5. Accessories: Shutter-Loks® mounting screws.

2.5 GABLE LOUVERS

A. Basis-of-Design Product: Mid-America Siding Components; Standard Gable Vents.
   1. Item No. 00 46 1212 001.
   2. Size: 12 by 12 inches.

2.6 MAILBOXES

A. Basis-of-Design Product: As indicated on Drawings.

2.7 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

B. Adhesive for Cellular PVC Trim: Product recommended by trim manufacturer.

C. Flashing: Comply with requirements in Section 07 6200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.

D. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and applicable requirements in Section 07 9200 "Joint Sealants" and recommended by sealant and substrate manufacturers for intended application.

2.8 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.
B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 09 9100 "Painting."

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install flat-grain lumber with bark side exposed to weather.

B. Install cellular PVC trim to comply with manufacturer’s written instructions.
C. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary.
   1. Use scarf joints for end-to-end joints.
   2. Stagger end joints in adjacent and related members.

D. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

E. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior trim.
   2. Shelving and clothes rods.
   3. Interior stairs and railings.

B. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Section 08 1416 "Flush Wood Doors" for wood frames and jambs for factory pre-hung interior flush wood doors.
   3. Section 09 9100 "Painting" for priming and backpriming of interior finish carpentry.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

C. Samples for Verification:
   1. For each species and cut of lumber and panel products with nonfactory-applied finish, with half of exposed surface finished, 50 sq. in. for lumber and 8 by 10 inches for panels.
   2. For each finish system and color of lumber and panel products with factory-applied finish, 50 sq. in. for lumber and 8 by 10 inches for panels.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored
in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, 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 American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's 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. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

B. MDF: ANSI A208.2, Grade 130.

2.2 INTERIOR TRIM

A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
1. Species and Grade: Red oak, Clear; NHLA.
2. Maximum Moisture Content: 13 percent.
4. Gluing for Width: Use for lumber trim wider than 6 inches.
5. Veneered Material: Not allowed.
6. Face Surface: Surfaced (smooth).
7. Matching: Selected for compatible grain and color.

B. Lumber Trim for Opaque Finish (Painted Finish):
1. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine, D Select (Quality); NeLMA, NLGA, or WWPA.
2. Maximum Moisture Content: 19 percent.
4. Face Surface: Surfaced (smooth).
5. Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.

C. Moldings for Opaque Finish (Painted Finish): Made to patterns included in MMPA’s "WM/Series Wood Moulding Patterns."
      a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
      b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
   2. Hardwood Moldings: MMPA HWM 4, P-grade.
      a. Species: Aspen, basswood, cottonwood, gum, magnolia, soft maple, tupelo, or yellow poplar.
      b. Maximum Moisture Content: 9 percent.
   3. Optional Material: Primed MDF.
   5. Base Pattern: As indicated.
   7. Casing Pattern: As indicated.
   8. Mull-Casing Pattern: As indicated.
   9. Stop Pattern: As indicated.
  10. Chair-Rail Pattern: As indicated.

2.3 SHELVING AND CLOTHES RODS
   A. Closet Shelving: Made from [the following material] [one of the following materials], 3/4 inch thick.
      1. Wood boards as specified above for lumber trim for opaque finish.
   B. Shelf Cleats: 3/4-by-5-1/2-inch boards, as specified above for shelving.
   C. Clothes Rods: 1-1/2-inch- diameter, clear, kiln-dried hardwood.
   D. Rod Flanges: Chrome-plated steel.

2.4 STAIRS AND RAILINGS
   A. Treads: 1-1/16-inch, clear, kiln-dried, edge-glued, red oak stepping with half-round nosing.
   B. Risers: 3/4-inch finish boards as specified above for interior lumber trim for opaque finish.
   C. Finished Stringers: 3/4-inch finish boards as specified above for interior lumber trim for opaque finish.
   D. Interior Railings: Clear, kiln-dried red oak, of pattern indicated, either solid or laminated.
2.5 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

2.6 FABRICATION

A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
   1. Interior standing and running trim, except shoe and crown molds.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.
B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
   3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   4. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
   5. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope or miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
   1. Install trim after gypsum-board joint finishing operations are completed.
   2. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 SHELVING AND CLOTHES ROD INSTALLATION

A. Cut shelf cleats at ends of shelves about 1/2 inch less than width of shelves and sand exposed ends smooth.

B. Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 16 inches o.c. Use two fasteners at each framing member or fastener location for cleats 4 inches nominal in width and wider.
   1. Apply a bead of multipurpose construction adhesive to back of shelf cleats before installing. Remove adhesive that is squeezed out after fastening shelf cleats in place.

C. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches o.c. Fasten to framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors.

D. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
   1. Fasten shelves to cleats with finish nails or trim screws, set flush.

E. Install rod flanges for rods as indicated. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.
3.6 STAIR AND RAILING INSTALLATION

A. Treads and Risers at Interior Stairs: Secure treads and risers by gluing and nailing to rough carriages.
   1. Closed Stringers: House treads and risers into wall stringers, glue, and wedge into place.

B. Railings: Secure wall rails with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws (or rail bolts) and glue. Assemble railings at goosenecks, easements, and splices with rail bolts and glue.

3.7 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.8 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.9 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
   1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION
SECTION 06 8200
GLASS-FIBER-REINFORCED PLASTIC FABRICATIONS

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 architectural glass-fiber-reinforced plastic (GFRP) fabrications for the following:
   1. Exterior columns.
   2. Exterior railings.
B. Related Requirements:
   1. Section 06 1000 “Rough Carpentry” for wood nailers and blocking.
   2. Section 06 1533 “Wood Patio Decking” for plastic decking and support framing for architectural fiberglass fabrications.
   3. Section 07 9200 “Joint Sealants” for field applied sealants.

1.3 ACTION SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Product Data: Submit manufacturer’s product data and installation instructions for architectural glass-fiber-reinforced plastic fabrications.
C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Illustrate dimensions, adjacent construction, materials, thickness, fabrications details, required clearances, field jointing, tolerances, colors, finishes, methods of support, attachments, anchorage to substrates, integration of components, and list of part numbers that coordinate with labeled architectural fiberglass parts.
   2. Show details full size.
D. Samples: Submit minimum 3-inch by 5-inch samples in specified color, texture and finish.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer and fabricator.
B. Product Certificates: For each type of product, signed by product manufacturer.
C. Certification: Manufacturer’s current valid certification with The Certified Composites Technician (CCT) program created by the American Composites Manufacturers Association (ACMA).

D. Submit current valid third party product Listing and Labeling from International Code Council (ICC)-sanctioned authority to be affixed to all products manufactured and delivered to the jobsite as required per the 2009 International Building Code (IBC). ICC–sanctioned Listing and Labeling Program shall be in place at time of Bid and state compliance with Flame Spread Index requirements stipulated in the 2009 IBC, Section 2612. Manufactured products without Listing and Labeling Program at time of Bid will not be considered.

E. Submit manufacturer’s internal Quality Control And Assurance Procedures based upon provisions published in the “Guidelines and Recommended Practices for Fiberglass Reinforced Plastic Architectural Products.”

F. Delegated-Design Submittal: For architectural glass-fiber-reinforced plastic (GFRP) fabrications, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Obtain architectural glass-fiber-reinforced plastic fabrications from a single source manufacturer that has the ability and resources to comply with the requirements and schedule of the project.

B. Manufacturer’s ICC–sanctioned Listing and Labeling Program shall include site visits to manufacturing facility by third party testing authority witnessing compliance with manufacturing procedures and Listing and Labeling Program.

C. Manufacturer to comply with Quality Control And Assurance Procedures, and fabricate architectural fiberglass based upon provisions published in the “Guidelines and Recommended Practices for Fiberglass Reinforced Plastic Architectural Products”.

D. Inspect each molded piece to ensure that it complies with specified requirements, including nominal dimensions.

1.6 DELIVERY, STORAGE AND HANDLING

A. Handle, store and transport architectural glass-fiber-reinforced plastic fabrications according to manufacturer’s recommendations and in a manner that prevents damage.

B. Protect architectural glass-fiber-reinforced plastic fabrications from damage by retaining shipping protection in place until installation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with architectural glass-fiber-reinforced plastic fabrications by field measurements before fabrication.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design fastening systems for architectural glass-fiber-reinforced plastic (GFRP) fabrications.
   1. Design Requirements: Architectural glass-fiber-reinforced plastic (GFRP) fabrications and fastening systems shall be designed, engineered, fabricated, and installed to comply with building codes, local codes, and Architect's design intent.

2.2 MANUFACTURERS

A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products indicated, as manufactured by Turncraft, White City, OR (tel. 800-423-3311 or 741-826-2911), or comparable products by one of the following:
   2. CBL Architectural Fiberglass, Inc., Hernando, MS (tel. 662-429-2277).
   5. Stromberg Architectural Products, Greenville, TX (tel. 903-454-0904).

B. Columns:
   2. Columns Styles: As indicated on Drawings.
   4. Base: One-piece molded base consistent with the Tuscan Order of classical architecture.
   5. Capitals/Ornamentals Type: As indicated on Drawings.
   6. Accessories: Uplift loads resistance achieved with a concealed connection using Simpson’s Epoxy-Tie anchoring system or similar product.

C. Railing Systems:
      a. Railing system shall be engineered, fabricated and installed to satisfy requirements of the International Building Code 2000 (IBC).
   2. Product: Polymer composite material that resists penetrating stains, warping, splitting, splintering, rotting and peeling.
      a. Style: Colonial.
   3. Provide fabricated rail sections as indicated on Drawings with the following newel post installation:
      a. Tower Mount: Installed above the deck with surface mount plate connectors.
      b. Post Mount: Installed over a 4 by 4 wood post.
      c. Joist Mount: Attached to joists with brackets under the deck.
2.3 MATERIALS


B. Pultruded Fiberglass: Manufacturer’s standard product.

C. Molded Exterior Surface: U-V inhibited, NPG-ISO polyester gel coat, 18 to 22 mils thick. Provide color to match texture and finish of sample approved by Architect.

D. Barrier Coat: Specifically formulated backup polyester surface veil 18 to 20 mils thick to prevent glass print through and ultimate Class A finish.

E. Back Up Laminate:
   1. Resin: Provide fire-retardant polyester resin with a Class 1 flame spread rating of 25 or less and smoke density under 450 without the use of antimony trioxide as characterized by the ASTM E-84 tunnel test at typical 1/8 inch glass mat laminate. General purpose resins will not be allowed.
   2. Filler: Provide functional filler added to resin matrix to minimize shrinkage, add stiffness, control opacity, add fire retardance, improve surface finish, minimize crazing, and control dimensional stability from weather extremes.
   3. Fiberglass Reinforcement: Type “E” fiberglass, glass cloth, matt and/or random chopped glass fibers. Glass content approximately 20 to 30 percent.
   4. Laminate Thickness: Provide a minimum of 3/16 inch nominal laminate thickness. Provide additional core reinforcements and sandwich structure for rigidity and structural integrity.

F. Anchors And Fasteners: Provide anchors, fasteners, and other accessories for proper installation of architectural glass-fiber-reinforced plastic fabrications as recommended and approved by fiberglass fabrication manufacturer.

2.4 FABRICATION

A. Custom Pattern/Mockups: Patterns and mockups shall be hand carved or CNC machined by skilled pattern makers with minimum of 10 years experience with architectural elements. Patterns and mockups shall be available at manufacturing facility for architect’s inspection and approval before molds are produced.

B. Custom Molds: Produce molds with ample layers of tooling resin, tooling gel-coat, glass fibers and/or flexible rubber by skilled mold makers with minimum of 10 years experience with architectural elements. Produced molds shall have rigidity and thickness to prevent distortion and deflection of molded architectural fiberglass.

C. Tolerances:
   1. Part Thickness: ± 1/8 inch.
   2. Gel Coat Thickness: ± 2.5 mils.
   3. Length: ± 1/8 inch
   4. Variation from Square: 1/8 inch.
   5. Hardware Location Variation: ± 1/4 inch.
D. Curing And Cleaning: Cure and clean components prior to shipment and remove material which may be toxic to plant or animal life or incompatible with adjacent building material.

E. Identification: Identify each architectural glass-fiber-reinforced plastic fabrications unit with a permanent serial number. Number parts to coordinate with shop drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Observe and verify field conditions that substrates are ready for installation of architectural glass-fiber-reinforced plastic fabrications. Verify on site dimensions with shop drawings and assume full responsibility for fitting the components to the structure.

B. Verify that bearing surfaces are true and level. Verify that support framing has been constructed to allow accurate placement, alignment and connection of architectural fiberglass fabrications to structure.

C. Report discrepancies between design dimensions and field dimensions which could adversely affect installation to the Architect.
   1. Do not proceed with installation until discrepancies are corrected, or until installation requirements are modified and approved by Architect.
   2. Beginning of installation means acceptance of existing conditions and fiberglass materials.

3.2 INSTALLATION

A. Install architectural fiberglass fabrications in accordance with manufacturer’s instructions and approved shop drawings.

B. Allowable Tolerances For Installed Units:
   1. Maximum offset from True Alignment: 1/4 inch in 20 feet.
   2. Maximum Variation from True Position: 1/2 inch in 20 feet.

3.3 CLEANING AND PROTECTION

A. Clean installed architectural fiberglass fabrications using cleaning methods and material approved by manufacturer.

B. Comply with manufacturer’s recommendations and instructions for protecting installed fabrications during construction activities.

END OF SECTION
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SECTION 07 1113
BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary
   Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes cold-applied, emulsified-asphalt dampproofing.
B. Related Requirements:
   1. Section 03 3000 "Cast-in-Place Concrete."

1.3 ACTION SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Product Data: For each type of product.

1.4 FIELD CONDITIONS
A. Weather Limitations: Proceed with application only when existing and forecasted weather
   conditions permit dampproofing to be performed according to manufacturers' written
   instructions.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL
A. Source Limitations: Obtain primary dampproofing materials and primers from single source
   from single manufacturer. Provide protection course and auxiliary materials recommended in
   writing by manufacturer of primary materials.
B. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction
   unless otherwise required.
2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equal:
   1. Euclid Chemical Company (The); an RPM company.
   2. Henry Company.
   3. Koppers Inc.

B. Trowel Coats: ASTM D 1227, Type II, Class 1.

C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.

D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.

B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

C. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

D. Patching Compound: [Epoxy or latex-modified repair mortar] [Asbestos-free fibered mastic] of type recommended in writing by dampproofing manufacturer.

E. Protection Course: ASTM D 6506, 1/8-inch thick, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions with Applicator present, for compliance with requirements for surface smoothness, surface moisture, and other conditions affecting performance of bituminous dampproofing work.

B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
B. Clean substrates of projections and substances detrimental to the dampproofing work; fill voids, seal joints, and remove bond breakers if any, as recommended in writing by prime material manufacturer.

C. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.
   1. Apply dampproofing to provide continuous plane of protection.
   2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. Concrete Foundations: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat; or apply one fibered brush or spray coat at not less than 3 gal./100 sq. ft.; or apply one trowel coat at not less than 4 gal./100 sq. ft.

3.5 INSTALLATION OF PROTECTION COURSE

A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.

3.6 CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

END OF SECTION
SECTION 07 2100
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and 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. Low-pressure, sprayed polyurethane foam.
B. Related Requirements:
   1. Section 07 2119 "Foamed-In-Place Insulation" for closed-cell spray polyurethane foam insulation.
   2. Section 07 2600 “Vapor Retarders” for vapor retarders not integral with insulation products.
   3. Section 09 2613 “Gypsum Veneer Plastering” for sound attenuation blankets used as acoustic insulation.
   4. Section 09 2900 "Gypsum Board" for sound attenuation blankets used as acoustic insulation.

1.3 ACTION SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS
A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 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. Available Manufacturers:
      a. DiversiFoam Products.
      b. Dow Chemical Company (The).
      c. Owens Corning.
      d. Pactiv Building Products.

2.2 GLASS-FIBER BLANKET

A. Available Manufacturers:
   1. CertainTeed Corporation.
   2. Guardian Building Products, Inc.
   3. Johns Manville; a Berkshire Hathaway company.
   5. Owens Corning.

B. 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.

C. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

2.3 ACCESSORIES

A. Insulation for Miscellaneous Voids:
   1. Low-Pressure, Sprayed Polyurethane Foam (LP-SPF): One-component, low-expansion, low-pressure polyurethane foam, complying with AAMA 812.
      a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following or equal:
         1) The Dow Chemical Company; GREAT STUFF PRO™ Window & Door Insulating Foam Sealant.
         2) Fomo Products, Inc.; Handi-Seal® Window & Door Sealant.
         3) Hilti USA; CF 812 Window & Door Pro, Low-Pressure Filler Foam.
B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

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.

3.3 INSTALLATION OF SLAB INSULATION

A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
   1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.4 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.

5. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
   a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

6. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
   a. Exterior Walls: Set units with facing placed toward interior of construction.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
   1. Low-Pressure, Spray Polyurethane Foam (LP-SPF): Apply according to manufacturer's written instructions.

3.5 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
SECTION 07 2119
FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes closed-cell spray polyurethane foam.

B. Related Requirements:
   1. Section 07 2100 "Thermal Insulation" for foam-plastic board insulation and low-pressure, sprayed polyurethane foam (LP-SPF).
   2. Section 07 2600 "Vapor Retarders" for vapor retarders.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Evaluation Reports: For spray-applied polyurethane foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 CLOSED-CELL SPRAY POLYURETHANE FOAM

A. Closed-Cell Spray Polyurethane Foam: ASTM C 1029, Type II, minimum density of 1.5 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. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following or equal:
   a. Icynene Inc.
   b. NCFI Polyurethanes; division of Barnhardt Mfg. Co.
   c. SWD Urethane Company.
   d. Volatile Free, Inc.

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.

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

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.

3.2 INSTALLATION

A. Comply with insulation manufacturer’s written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

C. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

D. Miscellaneous Voids: Apply according to manufacturer’s written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION
SECTION 07 2500
WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes building wrap and flexible flashing.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.
   1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

C. Shop Drawings: Show details of building wrap at terminations, openings, and penetrations. Show details of flexible flashing applications.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following or equal:
      a. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
      c. Fiberweb, Inc.; TYPAR MetroWrap.
   2. Water-Vapor Permeance: Not less than 8 perms per ASTM E 96/E 96M, Desiccant Method (Procedure A).
   3. Air Permeance: Not more than 0.004 cfm/sq. ft. at 0.3-inch wg when tested according to ASTM E 2178.
   4. Allowable UV Exposure Time: Not less than three months.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.
2.2  FLEXIBLE FLASHING

A.  Butyl Rubber Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.030 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 or equal:
       a.  DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
       b.  Raven Industries Inc.; Fortress Flashshield.
       c.  Fiberweb, Inc.; TYPAR Flashing Flex and TYPAR Peel & Stick Flashing and Flashing RA.

B.  Primer for Flexible Flashing: Product recommended in writing by flexible flashing manufacturer for substrate.

C.  Nails and Staples: Product recommended in writing by flexible flashing manufacturer and complying with ASTM F 1667.

PART 3 - EXECUTION

3.1  WATER-RESISTIVE BARRIER INSTALLATION

A.  Cover exposed exterior surface of sheathing with water-resistant barrier securely fastened to framing immediately after sheathing is installed.

B.  Cover sheathing with water-resistant barrier as follows:
   1.  Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
   2.  Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

C.  Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
   1.  Seal seams, edges, fasteners, and penetrations with tape.
   2.  Extend into jambs of openings and seal corners with tape.

3.2  FLEXIBLE FLASHING INSTALLATION

A.  Apply flexible flashing where indicated to comply with manufacturer's written instructions.
   1.  Prime substrates as recommended by flashing manufacturer.
   2.  Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
   3.  Lap flashing over water-resistant barrier at bottom and sides of openings.
   4.  Lap water-resistant barrier over flashing at heads of openings.
   5.  After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION
SECTION 07 2600

VAPOR RETARDERS

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 polyethylene vapor retarders.
   B. Related Requirements:
      1. Section 03 3000 "Cast-in-Place Concrete" for under-slab vapor retarders.
      2. Section 07 2100 "Thermal Insulation" for vapor retarders integral with insulation products.

1.3 ACTION SUBMITTALS
   A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
   B. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS
   A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 POLYETHYLENE VAPOR RETARDERS
   A. Polyethylene Vapor Retarders: ASTM D 4397, 6-mil- thick sheet, with maximum permeance rating of 0.1 perm.

2.2 ACCESSORIES
   A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS ON FRAMING

A. Place vapor retarders on side of construction indicated on Drawings.

B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.

D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.3 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION
SECTION 07 3113

ASPHALT SHINGLES

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. Asphalt shingles.
   2. Underlayment.
   3. Ridge vents.

B. Alternates: The Work of this Section is affected by one or more an alternates. Refer to Section 01 2300 “Alternates” for a description of alternates and for administrative and procedural requirements governing Alternates.

C. Related Requirements:
   1. Section 06 1600 "Sheathing" for roof sheathing.
   2. Section 07 6200 "Sheet Metal Flashing and Trim" for metal counterflashings and flashings.

1.3 DEFINITION

A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA’s "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.

C. Samples for Verification: For the following products, of sizes indicated:
   1. Asphalt Shingles: Full size.
   2. Ridge and Hip Cap Shingles: Full size.
   3. Ridge Vent: 12-inch-long Sample.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

C. Sample Warranty: For manufacturer's warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

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. Asphalt Shingles: 100 sq. ft. of each type, in unbroken bundles.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated location protected from weather, sunlight, and moisture according to manufacturer’s written instructions.

B. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

C. Protect unused roofing materials from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

D. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.11 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Manufacturing defects.
2. Material Warranty Period: 40 years from date of Substantial Completion, prorated, with first 10 years nonprorated.
3. Warranty Period for Alternate Shingles: 25 years from date of Substantial Completion, prorated, with first 5 years nonprorated.
4. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 100 mph for five years from date of Substantial Completion.
5. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for five years from date of Substantial Completion.
6. Workmanship Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

   1. Basis-of-Design Product: Subject to compliance with requirements, provide Timberline Natural Shadow Shingles by GAF Materials Corporation, or comparable product by one of the following or equal:
      b. CertainTeed Corporation.
      c. IKO.
      d. Malarkey Roofing Products Co.
      e. Owens Corning.
   2. Strip Size: Manufacturer's standard.
   3. Algae Resistance: Granules resist algae discoloration.
   4. Color and Blends: As selected by Architect from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

2.3 GLASS-FIBER-REINFORCED ASPHALT SHINGLES - ALTERNATE

   1. Basis-of-Design Product: Subject to compliance with requirements, provide Royal Sovereign 3-Tab Shingles by GAF Materials Corporation, or comparable product by one of the following or equal:
      b. CertainTeed Corporation.
      c. IKO.
      d. Malarkey Roofing Products Co.
      e. Owens Corning.
2. Strip Size: Manufacturer's standard.
3. Algae Resistance: Granules resist algae discoloration.
4. Color and Blends: As selected by Architect from manufacturer's full range.

2.4 UNDERLAYMENT MATERIALS

   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or equal:
      a. CertainTeed Corporation.
      b. GAF Materials Corporation.
      d. Owens Corning.

2.5 RIDGE VENTS

A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent for use under ridge shingles.

B. Ridge Vent Products:
      a. Net free area: 20 sq. in. per lin. ft.
      b. Color: Black.
      c. Dimensions: 11 inches wide by 48 inches long by 1 inch high.
      a. Net free area: 8.5 sq. in. per lin. ft.
      b. Color: Black.
      c. Dimensions: 5.12 inches wide by 48 inches long by 13/16 inch high.

2.6 ACCESSORIES

A. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch-diameter, sharp-pointed, with a minimum 3/8-inch-diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
   1. Shank: Barbed.
   2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

2.7 METAL FLASHING AND TRIM

A. Comply with requirements in Section 07 6200 "Sheet Metal Flashing and Trim."

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
1. Step Flashings: Fabricate with a headlap of 2 inches and a minimum extension of 5 inches over the underlying asphalt shingle and up the vertical surface.
2. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

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.
   1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provisions have been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Comply with underlayment manufacturer’s written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Self-Adhering Sheet Underlayment: Install, wrinkle free, over entire roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.

3.3 METAL FLASHING INSTALLATION

A. Install metal flashings and other sheet metal to comply with requirements in Section 07 6200 "Sheet Metal Flashing and Trim."
   1. Install metal flashings according to recommendations in NRCA’s "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Step Flashings: Install with a headlap of 2 inches and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

C. Rake Drip Edges: Install rake drip-edge flashings over underlayment and fasten to roof deck.

D. Eave Drip Edges: Install eave drip-edge flashings below underlayment and fasten to roof sheathing.

ASPHALT SHINGLES
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3.4 ASPHALT-SHINGLE INSTALLATION

A. Install asphalt shingles according to manufacturer’s written instructions, recommendations in NRCA’s "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
   1. Extend asphalt shingles 1/2 inch over fasciae at eaves and rakes.
   2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer’s recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Fasten asphalt-shingle strips with a minimum of six roofing nails located according to manufacturer’s written instructions.
   1. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

E. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

F. Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
   1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION
SECTION 07 4633
PLASTIC SIDING

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 vinyl siding, vinyl soffit and vinyl trim.

B. Alternates: The Work of this Section is affected by one or more an alternates. Refer to Section 01 2300 “Alternates” for a description of alternates and for administrative and procedural requirements governing Alternates.

C. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
   2. Section 06 2013 "Exterior Finish Carpentry" for exterior wood and cellular PVC trim.
   3. Section 07 2500 "Weather Barriers" for weather-resistant barriers.
   4. Section 07 4646 "Fiber-Cement Siding" for fiber-cement siding, soffit and trim boards.

1.3 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Samples for Initial Selection: For vinyl siding and soffit including related accessories.

D. Samples for Verification: For each type, color, texture, and pattern required.
   1. 24-inch- wide-by-36-inch- high Sample panel of siding assembled on plywood backing.
   2. 12-inch- long-by-actual-width Sample of soffit.
   3. 12-inch- long-by-actual-width Samples of trim and accessories.
1.5 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For vinyl siding Installer.
   B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

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. Furnish full lengths of vinyl [siding] [and] [soffit] including related accessories, in a quantity equal to 2 percent of amount installed.

1.8 QUALITY ASSURANCE
   A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
      1. Build mockups for vinyl siding and soffit including accessories.
         a. Size: Minimum 48 inches long by 60 inches high.
         b. Include outside corner on one end of mockup and inside corner on other end.
      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.

1.9 DELIVERY, STORAGE, AND HANDLING
   A. Deliver and store packaged materials in original containers with labels intact until time of use.
   B. Store materials under cover.

1.10 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Structural failures including cracking and deforming.
         b. Deterioration of materials beyond normal weathering.
      2. Warranty Period: 50 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 VINYL SIDING

   1. Basis-of-Design Product: Subject to compliance with requirements, provide Wolverine American Legend Vinyl Siding by CertainTeed Corporation or equal.

B. Horizontal Pattern: 8-inch exposure in plain, double, 4-inch board style.

C. Texture: Wood grain.

D. Nominal Thickness: 0.042 inch.

E. Minimum Profile Depth (Butt Thickness): 1/2 inch.

F. Nailing Hem: Double thickness.

G. Finish: Wood-grain print with clear protective coating containing not less than 70 percent PVDF.
   1. Colors: As selected by Architect from manufacturer's full range of colors.

2.3 VINYL SOFFIT

A. Vinyl Soffit: Integrially colored product complying with ASTM D 4477.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide Wolverine Universal Triple 4” Vinyl Soffit by CertainTeed Corporation or equal.

B. Texture: Smooth.

C. Ventilation: Provide unperforated soffit.

D. Nominal Thickness: 0.040 inch.

E. Minimum Profile Depth: 1/2 inch.

F. Colors: Match adjacent siding.

2.4 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
   1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
   1.  Texture:  Wood grain.

C.  Decorative Accessories:  Provide the following vinyl decorative accessories as indicated:
   1.  Corner posts.
   2.  Door and window casings.
   3.  Moldings and trim.

D.  Colors for Decorative Accessories:  As selected by Architect from manufacturer's full range of colors.

E.  Flashing:  Provide aluminum flashing complying with Section 07 6200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
   1.  Finish for Aluminum Flashing:  High-performance organic finish, same color as siding.

F.  Fasteners:
   1.  For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
   2.  For fastening vinyl, use aluminum or stainless-steel fasteners.  Where fasteners are exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

PART 3 - EXECUTION

3.1  EXAMINATION

A.  Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of vinyl siding and soffit and related accessories.

B.  Proceed with installation only after unsatisfactory conditions have been corrected.

3.2  PREPARATION

A.  Clean substrates of projections and substances detrimental to application.

3.3  INSTALLATION

A.  Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
   1.  Center nails in elongated nailing slots without binding siding to allow for thermal movement.

B.  Install vinyl siding and soffit and related accessories according to ASTM D 4756.
   1.  Install fasteners for horizontal vinyl siding no more than 16 inches o.c.

C.  Install joint sealants as specified in Section 07 9200 "Joint Sealants" and to produce a weathertight installation.
3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION
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SECTION 07 4646
FIBER-CEMENT SIDING

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 fiber-cement siding, soffit and trim boards.

B. Alternates: The Work of this Section is affected by one or more an alternates. Refer to Section 01 2300 “Alternates” for a description of alternates and for administrative and procedural requirements governing Alternates.

C. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
   2. Section 06 2013 "Exterior Finish Carpentry" for exterior wood and cellular PVC trim.
   3. Section 07 2500 "Weather Barriers" for weather-resistive barriers.
   4. Section 07 4633 "Plastic Siding" for vinyl siding, vinyl soffit and vinyl trim.

1.3 COORDINATION

A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Samples for Initial Selection: For fiber-cement siding and soffit including related accessories.

D. Samples for Verification: For each type, color, texture, and pattern required.
   1. 12-inch-long-by-actual-width Sample of siding.
   2. 24-inch-wide-by-36-inch-high Sample panel of siding assembled on plywood backing.
   3. 12-inch-long-by-actual-width Sample of soffit.
   4. 12-inch-long-by-actual-width Samples of trim and accessories.
1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding and soffit.
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.
D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

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. Furnish full lengths of fiber-cement siding and soffit including related accessories, in a quantity equal to 2 percent of amount installed.

1.8 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
   1. Build mockups for fiber-cement siding and soffit including accessories.
      a. Size: 48 inches long by 60 inches high.
      b. Include outside corner on one end of mockup and inside corner on other end.
   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.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.
B. Store materials on elevated platforms, under cover, and in a dry location.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
a. Structural failures including cracking and deforming.
b. Deterioration of materials beyond normal weathering.

2. Warranty Period: 50 years from date of Substantial Completion.

B. Special Warranty on Finishes: Manufacturer agrees to refinish fiber cement siding and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of finish to adhere to fiber cement siding and trim.
   2. Finish Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SIDING
   A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
      1. Manufacturers: Subject to compliance with requirements, provide products by the following:
         a. Allura, a Div. of Elementia.

   B. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

   C. Nominal Thickness: Not less than 5/16 inch.

   D. Horizontal Pattern: Boards 6-1/4 to 6-1/2 inches (5 inches to weather) wide in plain style.
      1. Texture: Smooth.

   E. Factory Finish: ColorMax Finishing System, solid colors.

2.3 FIBER-CEMENT SOFFIT
   A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
      1. Manufacturers: Subject to compliance with requirements, provide products by the following:
         a. Allura, a Div. of Elementia.

   B. Nominal Thickness: Not less than 5/16 inch.
C. Pattern: 24-inch-wide sheets with smooth texture.

D. Ventilation: Provide unperforated soffit.

E. Factory Finish: ColorMax Finishing System, solid colors.

2.4 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
   1. Provide accessories matching color and texture of adjacent siding 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 or equal:
      a. Allura USA; Allura Fiber-Cement Products by Plycem, a Div. of Elementia.
   2. Actual Thicknesses: ¾ and 1 inch.

C. Flashing: Provide aluminum flashing complying with Section 07 6200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
   1. Finish for Aluminum Flashing: High-performance organic finish, same color as siding.

D. Horizontal Pattern Boards Joint Flashing: Provide aluminum flashing at behind vertical joints in horizontal lap siding.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following or equal:
      a. Tamlyn; Plank Flash, Item PF6.

E. Fasteners:
   1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1 inch into substrate.
   2. For fastening fiber cement, use stainless-steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding, soffit and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.
3.3 INSTALLATION

A. Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
   1. Do not install damaged components.
   2. Install fasteners no more than 24 inches o.c.

B. Cement-Fiber Trim Board Installation:
   1. Fasten through trim into structural framing or code complying sheathing. Fasteners shall penetrate minimum 3/4 inch or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
   2. Place fasteners no closer than 3/4 inch and no further than 2 inches from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inches on center.
   3. Maintain clearance between trim and adjacent finished grade.

C. Install sheet metal wall flashing to intercept and exclude penetrating moisture according to manufacturer's written installation instructions and cited sheet metal standard. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

D. Sealing and Touch Up: Apply touch up paint to seal cut edges in accordance with manufacturer's printed instructions.

E. Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
   1. Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
   2. Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.

F. Install joint sealants as specified in Section 07 9200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

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SECTION 07 6200
SHEET METAL FLASHING AND TRIM

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. Formed roof-drainage sheet metal fabrications.
   2. Formed steep-slope roof sheet metal fabrications.
   3. Formed wall sheet metal fabrications.

B. Related Requirements:
   1. Section 07 4646 “Fiber-Cement Siding” for installation of sheet metal flashing and trim integral with fiber-cement siding.
   2. Section 07 3113 “Asphalt Shingles” for installation of sheet metal flashing and trim integral with roofing.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

C. Samples for Verification: For each type of exposed finish.
   1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
   2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
   3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.
B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

   1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
      a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
      b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
      c. Cracking, checking, peeling, or failure of 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: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations 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.

2.2 SHEET METALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
   1. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish 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.
   2. Color: As selected by Architect from manufacturer's full range.
   3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt; nonperforated.

B. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
   1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
      a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
      b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

SHEET METAL FLASHING AND TRIM
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2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness needed to comply with performance requirements, but not less than that specified for each application and metal.

2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.

4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.
G. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Seamless Hanging Gutters: Provide site-fabricated, continuous (seamless), roll-formed gutters. Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required for a complete installation. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard, but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.
   1. Gutter Profile: Style K according to cited sheet metal standard.
   2. Expansion Joints: Butt type with cover plate.
   3. Gutters: Fabricate from the following materials:
      a. Aluminum: 0.032 inch thick.
   4. Accessories: Continuous, removable leaf screen with sheet metal frame and hardware cloth screen.

B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors. Shop fabricate elbows.
   1. Fabricate from the following materials:
      a. Aluminum: 0.024 inch thick.

2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Step Flashing: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.

B. Drip Edges: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.

C. Rake Flashing: Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.

D. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with 2-inch- high, end dams. Fabricate from the following materials:
   1. Aluminum: 0.032 inch thick.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
   3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

B. Apply slip sheet, wrinkle free, over underlayment or directly on substrate before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
   1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
   2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
   3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.
   6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
   1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
   2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.
   1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. 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. Do not install sealant-type joints at temperatures below 40 deg F.

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

B. Seamless Hanging Gutters: Attach gutters at fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
   1. Fasten gutter spacers to front and back of gutter.
   2. Anchor gutter with concealed gutter brackets spaced not more than 24 inches apart and loosely lock to front gutter bead.
   3. Provide for thermal expansion by joining sections with joints sealed with sealant. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
   4. Install continuous gutter screens on gutters with noncorrosive fasteners, removable for cleaning gutters.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
   1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
   2. Provide elbows at base of downspout to direct water away from building.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

3.6 CLEANING AND PROTECTION

A. Clean off excess sealants.

B. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 07 8413
PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
   3. Penetrations in smoke barriers.

B. Related Requirements:
   1. Section 07 8443 "Joint Firestopping" for joints in or between fire-resistance-rated construction.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.

C. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.
1.6 CLOSEOUT SUBMITTALS
   A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE
   A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.8 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.

1.9 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 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 firestopping systems shall bear classification marking of a qualified testing agency.
         1) UL in its "Fire Resistance Directory."

2.2 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 shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
   2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 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 E 84.

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.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.

D. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

E. 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.

F. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

2.4 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.

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

A. 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 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.

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.

3.5 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.

END OF SECTION
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SECTION 07 8443

JOINT FIRESTOPPING

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 joints in or between fire-resistance-rated constructions.

B. Related Requirements:
1. Section 07 8413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.

C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each joint firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that joint firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.
1.7 QUALITY ASSURANCE
   A. Installer Qualifications: A firm that has been approved by FM Global according to
      FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to
      comply with UL's "Qualified Firestop Contractor Program Requirements."

1.8 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.

1.9 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 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 firestopping systems shall bear classification marking of a qualified testing
            agency.
            1) UL in its "Fire Resistance Directory."

2.2 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 shall accommodate building
      movements without impairing their ability to resist the passage of fire and hot gases.
   B. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems
      with ratings determined per ASTM E 1966 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.
C. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. Accessories: Provide components of fire-resistive joint 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.

3.2 PREPARATION

A. Surface Cleaning: Before installing fire-resistive joint 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.

3.3 INSTALLATION

A. Install fire-resistive joint 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 fire-resistive joint 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 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2393.
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.

3.5 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 fire-resistant joint systems immediately and install new materials to produce fire-resistant joint systems complying with specified requirements.

END OF SECTION
SECTION 07 9200

JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Mildew-resistant joint sealants.
   4. Butyl joint sealants.
   5. Latex joint sealants.

B. Related Requirements:
   1. Section 07 8413 "Penetration Firestopping" for sealing penetrations in fire-resistance-rated construction.
   2. Section 07 8443 "Joint Firestopping" for sealing joints in fire-resistance-rated construction.
   3. Section 09 2613 "Gypsum Veneer Plastering" for acoustical joint sealant at perimeters, behind control joints, and at openings and penetrations in gypsum veneer plaster assemblies concealed by subsequent construction.
   4. Section 09 2900 "Gypsum Board" for acoustical joint sealant at perimeters, behind control joints, and at openings and penetrations in gypsum board assemblies concealed by subsequent construction.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each joint-sealant product.

C. 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.
D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.7 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.

1.8 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
   2. Disintegration of joint substrates from causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric
   contaminants.

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. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent
   movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S,
   Grade NS, Class 50, Use NT.
   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. Dow Corning Corporation.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      d. Pecora Corporation.
      e. Sika Corporation; Joint Sealants.

2.3 URETHANE JOINT SEALANTS

A. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent
   movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M,
   Grade P, Class 25, Uses T and NT.
   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. BASF Corporation-Construction Systems.
      b. Bostik, Inc.
      c. LymTal International Inc.
      d. Pecora Corporation.
      e. Sika Corporation; Joint Sealants.
      f. Tremco Incorporated.

2.4 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, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
   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. Dow Corning Corporation.
      b. GE Construction Sealants; Momentive Performance Materials Inc.
      d. Soudal USA.
      e. Tremco Incorporated.

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following or equal:
      b. Pecora Corporation; BC-158.

2.6 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following or equal:
      a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
      c. Pecora Corporation; AC-20.
      d. Tremco Incorporated; Tremflex 834.

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 C 1330, Type C (closed-cell material with a surface skin), 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.

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. 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 C 1193 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 C 1193 unless otherwise indicated.

3.4 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.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.
3.6 **JOINT-SEALANT SCHEDULE**

A. **Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.**
   1. **Joint Locations:**
      a. Control and expansion joints in brick pavers.
      b. Isolation and contraction joints in cast-in-place concrete slabs.
      c. Joints between plant-precast architectural concrete paving units.
      d. Joints in stone paving units, including steps.
      e. Joints between different materials listed above.
      f. Other joints as indicated on Drawings.
   2. **Joint Sealant:** Urethane, M, P, 50, T, NT.
   3. **Joint-Sealant Color:** As selected by Architect from manufacturer's full range of colors.

B. **Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.**
   1. **Joint Locations:**
      b. Control and expansion joints in unit masonry.
      c. Joints in fiber-cement siding not backed by metal flashing.
      d. Joints between different materials listed above.
      e. Perimeter joints between materials listed above and frames of doors, windows and louvers.
      f. Control and expansion joints in ceilings and other overhead surfaces.
      g. Other joints as indicated on Drawings.
   2. **Joint Sealant:** Silicone, nonstaining, S, NS, 50, NT.
   3. **Joint-Sealant Color:** As selected by Architect from manufacturer's full range of colors.

C. **Joint-Sealant Application: Interior joints in horizontal traffic surfaces.**
   1. **Joint Locations:**
      b. Other joints as indicated on Drawings.
   2. **Joint Sealant:** Urethane, S, P, 25, T, NT.
   3. **Joint-Sealant Color:** As selected by Architect from manufacturer's full range of colors.

D. **Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.**
   1. **Joint Locations:**
      a. Control joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
      c. Gaps between wood standing and running trim (window casings, door casings, baseboard, chair rails, crown moldings) and gypsum board surfaces.
      d. Other joints as indicated on Drawings.
   2. **Joint Sealant:** Acrylic latex.
   3. **Joint-Sealant Color:** As selected by Architect from manufacturer's full range of colors.

E. **Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.**
   1. **Joint Locations:**
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Other joints as indicated on Drawings.
   2. **Joint Sealant:** Silicone, mildew resistant, acid curing, S, NS, 25, NT.
   3. **Joint-Sealant Color:** As selected by Architect from manufacturer's full range of colors.
F. Joint-Sealant Application: Concealed mastics.
   1. Joint Locations:
      a. Aluminum thresholds.
      b. Sill plates.
      c. Other joints as indicated on Drawings.

END OF SECTION
SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hollow-metal work.

B. Related Requirements:
   1. Section 08 1416 “Flush Wood Doors.”
   2. Section 08 3113 “Access Doors And Frames.”
   3. Section 08 7100 “Door Hardware” for door hardware for hollow-metal doors.

1.3 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.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product. Include construction details, material descriptions, core descriptions, and finishes.

C. Samples for Verification:
   1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
   1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and Mullions.
C. Store hollow-metal work 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 or equal:
   1. Amweld International, LLC.
   2. Ceco Door Products; an Assa Abloy Group company.
   3. Deansteel.
   4. Mesker Door Inc.
   5. Pioneer Industries, Inc.
   7. Steelcraft; an Ingersoll-Rand company.

2.2 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.
   1. Physical Performance: Level B according to SDI A250.4.
   2. Doors:
      a. Type: As indicated in the Door and Frame Schedule.
      b. Thickness: 1-3/4 inches
      c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A40 coating.
      d. Edge Construction: Model 2, Seamless.
      e. Core: Polyurethane.
         1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
   3. Frames:
      a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
      b. Construction: Full profile welded.

2.3 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.4 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.5 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:
   1. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
   2. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
   3. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
   4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.

3. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Four anchors per jamb from 60 to 90 inches high.
   b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

2.6 STEEL FINISHES

A. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.


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.

3.2 PREPARATION

A. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
3.3 INSTALLATION

A. Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
      a. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   3. 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.
   4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
      a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
      b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
      c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
      d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Steel Doors:
      a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
      b. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
      c. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

END OF SECTION
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SECTION 08 1416

FLUSH WOOD DOORS

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. Solid-core flush wood doors with wood-veneer faces.
   2. Wood frames and jambs for interior flush wood doors.
   3. Factory fitting and prehanging flush wood doors to frames and factory machining for hardware.
   4. Factory finishing flush wood doors and frames.

B. Related Requirements:
   1. Section 08 1113 "Hollow Metal Doors And Frames."
   2. Section 08 1436 "Hinged Wood-Framed Glass Doors."
   3. Section 08 7100 "Door Hardware."

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of door and frame. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.

C. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
   1. Dimensions and locations of blocking.
   2. Dimensions and locations of mortises and holes for hardware.
   3. Dimensions and locations of cutouts.
   4. Undercuts.
   5. Requirements for veneer matching.
   6. Doors and frames to be factory finished and finish requirements.

D. Samples for Verification:
   1. Factory finishes applied to actual door face materials and door frame 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.
1.4 INFORMATIONAL SUBMITTALS
   A. Sample Warranty: For special warranty.

1.5 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.

1.6 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 HVAC system is operating and
      maintaining ambient temperature and humidity conditions at occupancy levels during remainder
      of construction period.

1.7 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or
      workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
         b. 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 repair or
         replacement of defective doors.

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 or
      equal:
      1. Algoma Hardwoods, Inc.
      2. Eggers Industries.
      3. Graham Wood Doors; an Assa Abloy Group company.
      5. Mohawk Doors; a Masonite company.
      6. VT Industries, Inc.
   B. Source Limitations: Obtain flush wood doors from single manufacturer.
2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Standards."

B. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
1. Grade: Premium, with Grade A faces.
2. Species: Select white birch to match existing.
3. Cut: Plain sliced.
5. Exposed Vertical Edges: Applied wood edges of same species as faces and covering edges of crossbands - AWI Edge Type D - Solid Wood.
7. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

2.4 INTERIOR FRAMES AND JAMBS FOR OPAQUE FINISH

A. Grade: Custom.

B. Wood Species: Any closed-grain hardwood.

2.5 FABRICATION

A. Fabricate wood frames to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
1. Edges of Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

B. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2.6 FACTORY FINISHING

A. Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors and frames.

C. Transparent Finish for Doors:
   1. Grade: Premium.
   2. Finish: AWI System 5, conversion varnish; or System 9, UV curable, acrylated epoxy, polyester, or urethane; or System 10, UV curable, water based; or System 11, catalyzed polyurethane.
   3. Staining: Match existing doors.
   4. Sheen: Match existing.

D. Opaque Finish for Interior Frames:
   1. Grade: Custom.
   2. Finish: AWI System 4, water-based latex acrylic.
   4. Sheen: Semigloss, 46-60 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and 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.

3.2 INSTALLATION

A. Install wood frames level, plumb, true, and straight. Shim as required with concealed shims.
   Install level and plumb to a tolerance of 1/8 inch in 96 inches.

B. Scribe and cut wood frames to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

C. Anchor wood frames to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
   1. For shopfinished items, use filler matching finish of items being installed.
D. Touch up finishing work specified in this Section after installation of wood frames. Fill nail holes with matching filler where exposed.

E. Hardware: For installation, see Section 08 7100 "Door Hardware."

F. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

G. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

H. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 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 repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

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SECTION 08 1436
HINGED WOOD-FRAMED GLASS DOORS

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 aluminum-clad hinged wood-framed glass doors.
B. Related Requirements:
   1. Section 08 5200 "Wood Windows" for aluminum-clad wood windows.
   2. Section 08 7100 "Door Hardware" for hardware not specified in this Section.
   3. Section 09 9100 "Painting" for on-site finishing of factory-primed interior surfaces of hinged wood-framed glass doors.

1.3 ACTION SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Product Data: For each type of hinged wood-framed glass door.
   1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.
C. Samples for Verification: For hinged wood-framed glass doors and components required, prepared on Samples of size indicated below:
   1. Main Framing Member: 12-inch-long section with weather stripping, glazing bead, and factory-applied color finish.
   2. Hardware: Full-size units with factory-applied finish.
D. Product Schedule: For hinged wood-framed glass doors. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
A. Product Test Reports: For each hinged wood-framed glass door, for tests performed by manufacturer and witnessed by a qualified testing agency; and for each class and performance grade indicated, tested at AAMA gateway size.
B. Sample Warranty: For special warranty.
1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to hinged wood-framed glass door manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Manufacturer’s Special Warranty: Manufacturer agrees to repair or replace hinged wood-framed glass doors 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.
      c. Excessive water leakage or air infiltration.
      d. Faulty operation of movable panels and hardware.
      e. Deterioration of wood, metals, vinyl, and other materials and finishes beyond normal weathering.
      f. Failure of insulating glass.
   2. Warranty Period:
      a. Hinged Door: Two years from date of Substantial Completion.
      b. Insulating Glass: 10 years from date of Substantial Completion.
      c. Metal Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hinged wood-framed glass doors from single source from same manufacturer as aluminum-clad wood windows.

2.2 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
   1. Product Certification: AMMA certified with label attached to each door.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
   1. Minimum Performance Class: Class LC.
   2. Minimum Performance Grade: Grade 30.

C. Thermal Transmittance: NFRC 100 maximum total fenestration product U-factor of 0.32 Btu/sq. ft. x h x deg F.
D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum total fenestration product SHGC of 0.30.

2.3 ALUMINUM-CLAD HINGED WOOD-FRAMED GLASS DOORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. EAGLE Window & Door, Inc.; a subsidiary of Andersen Corporation.
   2. Kolbe & Kolbe Millwork Co., Inc.
   4. Pella Corporation.

B. Exterior Surfaces: Aluminum cladding with manufacturer's standard fluoropolymer two-coat system with fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight and complying with AAMA 2605.
   1. Color: As indicated on Drawings.

C. Interior Surfaces: Manufacturer's standard factory-applied primer.
   1. Wood Species: Manufacturer's standard species.

D. Frames and Door Panels: Fabricate from wood components complying with indicated requirements. Provide factory-assembled door panels with standard-profile stiles and factory-assembled frames.

E. Wood Components: Manufacturer's standard LVL or fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.

F. Trim and Glazing Stops: Material and finish to match cladding.

G. Mullions: Provide mullions and mullion casing and cover plates as shown, matching door units, complete with anchors for support to structure and installation of hinged wood-framed glass door units. Allow for erection tolerances and provide for movement of door units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of door units.

H. Integral Nailing Fin: Aluminum nailing fins for securing frame to structure; provide sufficient strength to withstand design pressure indicated.

I. Drip Caps: Extruded aluminum, factory fabricated and finished to match door frame; designed to direct water away from building when installed horizontally at head of hinged wood-framed glass doors.

J. Threshold: Provide extruded aluminum threshold of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to exterior.
   2. Low-Profile Threshold: ADA-ABA compliant.
2.4 GLAZING

A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal.
   1. Glass: ASTM C 1036, Type 1, q3, Category II safety glass complying with testing requirements in 16 CFR 1201.
   2. Safety Glazing Labeling: Permanently mark safety glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
   3. Tint: Clear.
   4. Insulating-Glass Units: ASTM E 2190, certified through IgCC as complying with requirements of IgCC.
      a. Filling: Fill space between glass lites with argon.
      b. Lites: Two.
      c. Low-E Coating: Pyrolytic on second surface.

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with wood and aluminum cladding complying with AAMA 907; designed to smoothly operate, tightly close, and securely lock hinged wood-framed glass doors and sized to accommodate panel weight and dimensions.

B. Lock: Install manufacturer's standard keyed multipoint locking device on each operable panel, lockable from the inside and outside.
   1. Design: As selected from manufacturer's full range.
   2. Finish: As selected from manufacturer's full range of finishes.

2.6 INSECT SCREENS

A. General: Design hinged wood-framed glass doors to accommodate screens in a tight-fitting, removable arrangement. Provide sliding screen for each operable door panel at double patio doors only. Comply with SMA 1201.

B. Insect Screen Frames: Manufacturer's standard extruded-aluminum or formed-tubular-aluminum members, with mitered or coped joints, concealed fasteners, adjustable rollers, and removable PVC or PE spline/anchor concealing edge of mesh. Provide finish to match door frame.

C. Glass-Fiber Mesh Fabric: ASTM D 3656, 18-by-14 or 18-by-16 count per sq. in. mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656.
   1. Mesh Color: Manufacturer's standard.

D. Hardware: Manufacturer's standard noncorrosive metal.
   1. Lock: Manufacturer's standard pull and keyless locking device on each movable panel, lockable from inside only.
2.7 ACCESSORIES

A. Grilles (False Muntins): Provide grilles in designs indicated.
   1. Type: Between-glass grille.
   2. Design: Rectangular as indicated on Drawings.
   4. Bar Profile: Match windows.

B. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components.
   1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

C. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for hinged wood-framed glass doors, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.
   1. Windborne-Debris Resistance: Provide anchors of same design used in windborne-debris resistance testing.

2.8 FABRICATION

A. Fabricate hinged wood-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

B. Fabricate hinged wood-framed glass doors that are reglazable without dismantling panel framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each door panel unless otherwise indicated.

D. Factory machine hinged wood-framed glass doors for openings and hardware that is not surface applied.

E. 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. Allow for scribing, trimming, and fitting at Project site.

F. Factory-Glazed Fabrication: Glaze hinged aluminum-framed glass doors in the factory.

2.9 WOOD FINISHES

2.10 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 indicated on Drawings.

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 Work.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight hinged door installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing hinged doors, hardware, accessories, and other components.

B. Install hinged wood-framed glass doors level, plumb, square, true to line; without distortion, warp, or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders, air barriers, water/weather barriers, and other adjacent construction. Comply with ASTM E2112.

C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E2112.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Lubricate hardware and moving parts.

B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and weathertight closure.

C. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.
D. Clean exposed surfaces immediately after installing hinged wood-framed glass doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.

E. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

F. Protect hinged wood-framed glass door surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances contact hinged wood-framed glass door surfaces, remove contaminants immediately according to manufacturer's written instructions.

G. Refinish or replace hinged doors with damaged finishes.

H. Replace damaged components.

END OF SECTION
SECTION 08 3113
ACCESS DOORS AND FRAMES

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 access doors and frames for walls into crawl spaces.

1.3 ACTION SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Product Data: For each type of product. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
C. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.
D. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

1.4 COORDINATION
A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the Product Schedule specified in the Article "Action Submittals."

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following or equal:
   1. Babcock-Davis.
   3. Milcor Inc.
   4. Nystrom, Inc.
   5. Williams Bros. Corporation of America (The).
2.2 ACCESS DOORS AND FRAMES

A. Flush Access Doors with Exposed Flanges:
   1. Description: Face of door flush with frame, with exposed flange and concealed hinge.
   2. Locations: Wall.
   3. Door Size: As indicated on Drawings.
   4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage, factory finished.
   5. Frame Material: Same material, thickness, and finish as door.
   6. Latch and Lock: Cam latch, key operated with interior release.

2.3 FIRE-RATED ACCESS DOORS AND FRAMES

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.

B. Fire-Rated, Flush Access Doors with Exposed Flanges:
   1. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
   2. Locations: Wall.
   3. Door Size: As indicated on Drawings.
   4. Fire-Resistance Rating: Not less than that indicated or, if not indicated, 1 hour.
   5. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch, 20 gage, factory finished.
   6. Frame Material: Same material, thickness, and finish as door.
   7. Latch and Lock: Self-latching door hardware, operated by key with interior release.

2.4 MATERIALS

A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

B. Frame Anchors: Same material as door face.

C. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

A. 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.

2.6 FINISHES

A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
   1. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil for topcoat.

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.

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.

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SECTION 08 5200

WOOD WINDOWS

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 aluminum-clad wood windows.

B. Alternates: The Work of this Section is affected by one or more an alternates. Refer to Section 01 2300 “Alternates” for a description of alternatives and for administrative and procedural requirements governing Alternates.

C. Related Requirements:
   1. Section 06 1600 "Sheathing" for wall sheathing.
   2. Section 07 2500 "Weather Barriers" for building wrap and flexible flashing.
   3. Section 07 6200 "Sheet Metal Flashing and Trim" for metal counterflashings and flashings.
   4. Section 08 5313 “Vinyl Windows” for vinyl windows.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.
   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.

C. Samples for Verification: For wood windows and components required, prepared on Samples of size indicated below:
   1. Exposed Finishes: 2 by 4 inches.
   2. Exposed Hardware: Full-size units.

D. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.

WOOD WINDOWS
08 5200 - 1
B. Sample Warranties: For manufacturer's warranties.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:
      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, 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:
      a. Window: 10 years from date of Substantial Completion.
      b. Glazing Units: 10 years from date of Substantial Completion.
      c. Aluminum-Cladding Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wood windows from single source from single manufacturer.

2.2 WINDOW 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.

   1. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

   1. Minimum Performance Class: LC.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

2.3 WOOD WINDOWS

A. Aluminum-Clad Wood 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 or equal:
      a. EAGLE Window & Door, Inc.; an Andersen Window & Door company.
      b. Kolbe & Kolbe Millwork Co., Inc.
      c. Marvin Windows and Doors.
d. Pella Corporation.

B. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Double hung.
2. Casement: Project out.
3. Fixed.

C. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
      a. Aluminum Finish: Manufacturer's standard fluoropolymer two-coat system with fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight and complying with AAMA 2605.
      b. Color: As selected by Architect from manufacturer's full range.
   2. Interior Finish: Manufacturer's standard factory-prime coat.

D. Insulating-Glass Units: ASTM E 2190.
   1. Glass: ASTM C 1036, Type 1, Class 1, q3.
   2. Lites: Two.
   3. Filling: Fill space between glass lites with argon.
   4. Low-E Coating: Sputtered on second surface.

E. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

F. Hardware, 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.

G. 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. Provide custodial locks.
   3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

H. Projected Window Hardware:
   1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
      a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
   2. Hinges: Manufacturer's standard type for sash weight and size indicated.
   3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.
I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

J. 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 ACCESSORIES

A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.
   1. Quantity and Type: One permanently located between insulating-glass lites.
   3. Pattern: As indicated on Drawings.
   4. Profile: As selected by Architect from manufacturer's full range.
   5. Color: As selected by Architect from manufacturer's full range.

2.5 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: Full, outside for double-hung and full, inside for project-out sashes.

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.
   2. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.

C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656/D 3656M.
   1. Mesh Color: Manufacturer's standard.

2.6 FABRICATION

A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze wood windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. 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.
E. 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. Allow for scribing, trimming, and fitting at Project site.

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.

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 E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

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. Remove excess sealants, glazing materials, dirt, and other substances.
   1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass 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.

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SECTION 08 5313

VINYL WINDOWS

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 vinyl-framed windows.

B. Alternates: The Work of this Section is affected by one or more an alternates. Refer to Section 01 2300 “Alternates” for a description of alternates and for administrative and procedural requirements governing Alternates.

C. Related Requirements:
   1. Section 06 1600 "Sheathing" for wall sheathing.
   2. Section 07 2500 "Weather Barriers" for building wrap and flexible flashing.
   3. Section 07 6200 "Sheet Metal Flashing and Trim" for metal counterflashings and flashings.

1.3 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 and avoid delays.
   2. Review, discuss, and coordinate the interrelationship of vinyl 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 weatherlight exterior building envelope.
   4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.
   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for vinyl windows.
C. Shop Drawings: For vinyl windows.
   1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

D. Samples for Verification: For vinyl windows and components required, prepared on Samples of size indicated below:
   1. Exposed Finishes: 2 by 4 inches.
   2. Exposed Hardware: Full-size units.

E. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and Installer.

B. Product Test Reports: For each type of vinyl window, for tests performed by a qualified testing agency.

C. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating vinyl windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to vinyl window manufacturer for installation of units required for this Project.

C. 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 mockup of typical wall area as shown on Drawings.
   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.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection, water leakage, 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:
a. Window: 10 years from date of Substantial Completion.
b. Glazing Units: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Harvey Classic Double Hung Vinyl Windows and Harvey Casement Vinyl Windows by Harvey Building Products, or equal.

B. Source Limitations: Obtain vinyl windows from single source from single manufacturer.

2.2 WINDOW 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.
   1. Window Certification: WDMA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
   1. Minimum Performance Class: R.
   2. Minimum Performance Grade: 35.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F) [0.32 Btu/sq. ft. x h x deg F].

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

2.3 VINYL WINDOWS

A. Operating Types: Provide the following operating types in locations indicated on Drawings:
   1. Double hung.
   2. Casement: Project out.
   3. Fixed.

   1. Finish: Integral color, white.
   2. Gypsum Board Returns: Provide at interior face of frame.

C. Insulating-Glass Units: ASTM E 2190.
   1. Glass: ASTM C 1036, Type 1, Class 1, q3.
      a. Tint: Clear.
   2. Lites: Two.
   3. Filling: Fill space between glass lites with argon.
   4. Low-E Coating: Sputtered on second surface.
D. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

E. Hardware, 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.

F. 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 Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

G. Projected Window Hardware:
   1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
      a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
   2. Hinges: Manufacturer's standard type for sash weight and size indicated.
   3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.

H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

I. 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 ACCESSORIES

A. Dividers (False Muntins): Provide divider grilles in designs indicated for each sash lite.
   1. Quantity and Type: One permanently located between insulating-glass lites.
   3. Pattern: As indicated on Drawings.
   4. Profile: As selected by Architect from manufacturer's full range.
   5. Color: As selected by Architect from manufacturer's full range.

2.5 INSECT SCREENS

A. Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
1. Type and Location: Full, outside for double-hung sashes, and full, inside for project-out sashes.

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.
   2. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.

C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656/D 3656M.
   1. Mesh Color: Manufacturer's standard.

2.6 FABRICATION

A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.
   1. Welded Frame and Sash/Ventilator Corners: Miter-cut and fusion or chemically welded.

B. Glaze vinyl windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, compatible with 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. Provide manufacturer's standard finish to match window units.

E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.

F. 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. Allow for scribing, trimming, and fitting at Project site.

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.

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 E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Windows will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 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. Remove excess sealants, glazing materials, dirt, and other substances.
   1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass 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
SECTION 08 7100

DOOR HARDWARE

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 mechanical door hardware.

B. Related Requirements:
   1. Section 08 1213 "Hollow Metal Frames" for door silencers provided as part of hollow-metal frames.
   2. Section 08 1416 "Flush Wood Doors."

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

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. Submit Samples before, or concurrent with, submission of 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.
      a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

D. Other Action Submittals:
   1. 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.
      a. Submittal Sequence: Submit door hardware schedule after or concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.

   c. Content: Include the following information:

1) Identification number, location, hand, size, and material of each door and frame.

2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.

3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.

4) Fastenings and other pertinent information.

5) Explanation of abbreviations, symbols, and codes contained in schedule.

6) Mounting locations for door hardware.

7) List of related door devices specified in other Sections for each door and frame.

2. 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.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Architectural Hardware Consultant.

B. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware schedule.

1.6 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.

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).

C. Source Limitations: Obtain each type of door hardware from a single manufacturer.

D. Means of Egress Doors: Latches do not require more than 15 lb to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. 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, and 521 CMR, Massachusetts Architectural Access Board (AAB).
F. Keying Conference: Conduct conference at Project site.

G. 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 and avoid delays.
   2. Inspect and discuss preparatory work performed by other trades.

1.7 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.

C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.8 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. 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.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. 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.

1.10 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 on Drawings 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.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Hager Companies.
      b. Lawrence Hardware Inc.
      c. McKinney Products Company; an ASSA ABLOY Group company.
      d. Stanley Commercial Hardware; Div. of The Stanley Works.

2.3 MECHANICAL LOCKS AND LATCHES

A. Lock Functions: As indicated in door hardware schedule.

B. Lock Throw:
   1. Bored Locks: Minimum 1/2-inch latchbolt throw.

C. Lock Backset: 2-3/4 inches, unless otherwise indicated.

D. Lock Trim:
   1. Description: As indicated on Drawings.
   2. Levers: Wrought.

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. Bored Locks: BHMA A156.2; Grade 1; Series 4000.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
      b. Schlage Commercial Lock Division; an Ingersoll-Rand company.
      c. Yale Security Inc.; an ASSA ABLOY Group company.

G. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
1. **Basis-of-Design Product**: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
   b. Schlage Commercial Lock Division; an Ingersoll-Rand company.
   c. Yale Security Inc.; an ASSA ABLOY Group company.

2.4 **LOCK CYLINDERS**

   A. **Lock Cylinders**: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
      1. **Manufacturer**: Same manufacturer as for locking devices.

   B. **Standard Lock Cylinders**: BHMA A156.5; Grade 1; permanent cores that are interchangeable; face finished to match lockset.

2.5 **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. **Existing System**:
         a. Master key or grand master key locks to Owner's existing system.

   B. **Keys**: Nickel silver.
      1. **Quantity**: In addition to one extra key blank for each lock, provide the following:
         a. **Cylinder Change Keys**: Three.
         b. **Master Keys**: Five.

2.6 **OPERATING TRIM**

   A. **Operating Trim**: BHMA A156.6; stainless steel, unless otherwise indicated.
      1. **Basis-of-Design Product**: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
         a. Don-Jo Mfg., Inc.
         b. Hager Companies.
         c. Rockwood Manufacturing Company.
         d. Trimco.

2.7 **MECHANICAL STOPS**

   A. **Wall- and Floor-Mounted Stops**: BHMA A156.16; polished cast brass, bronze, or aluminum base metal.
      1. **Basis-of-Design Product**: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
         a. Don-Jo Mfg., Inc.
         b. Hager Companies.
         c. Rockwood Manufacturing Company.
         d. Trimco.
2.8 SLIDING DOOR HARDWARE

A. Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Hager Companies.
      b. Johnson, L. E., Products, Inc.
      c. Stanley Commercial Hardware; Div. of The Stanley Works.

2.9 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. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Don-Jo Mfg., Inc.
      b. IVES Hardware; an Ingersoll-Rand company.
      c. Rockwood Manufacturing Company.
      d. Trimco.

2.10 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except 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. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.11 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, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

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.
   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. 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, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
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.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware as necessary to ensure function of doors and 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.

END OF SECTION
SECTION 09 2613

GYPSUM VENEER PLASTERING

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 gypsum veneer plaster and gypsum base for veneer plaster.

B. Related Requirements:
   1. Section 06 1000 “Rough Carpentry” for wood framing.
   2. Section 07 8413 “Penetration Firestopping” for firestopping through penetrations in fire-rated gypsum partitions.
   3. Section 07 8443 “Joint Firestopping” for firestopping perimeter joints in fire-rated gypsum partitions.
   4. Section 09 2900 “Gypsum Board” for gypsum board partitions.
   5. Section 09 9100 “Painting” for field painting gypsum veneer plaster.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Mockups: Provide a full-thickness finish mockup for each type and finish of gypsum veneer plaster and substrate to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select representative surfaces and conditions for application of each type of gypsum veneer plaster and substrate.
   2. Provide mockups of ceilings and partitions in sizes of at least 100 sq. ft.
   3. Apply gypsum veneer plaster, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, and bundles bearing brand name and identification of manufacturer or supplier.

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B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

C. Stack panels flat on leveled supports off floor or slab to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 843 requirements or gypsum veneer plaster manufacturer’s written recommendations, whichever are more stringent.

B. Room Temperatures: Maintain not less than 55 deg F or more than 80 deg F for seven days before application of gypsum base and gypsum veneer plaster, continuously during application, and after application until veneer plaster is dry.

C. Avoid conditions that result in gypsum veneer plaster drying too rapidly.
   1. Distribute heat evenly; prevent concentrated or uneven heat on veneer plaster.
   2. Maintain relative humidity levels, for prevailing ambient temperature, that produce normal drying conditions.
   3. Ventilate building spaces in a manner that prevents drafts of air from contacting surfaces during veneer plaster application until it is dry.

D. Do not install panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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 MANUFACTURERS

A. Source Limitations: Obtain gypsum veneer plaster products, including gypsum base for veneer plaster, joint reinforcing tape, and embedding material, from single manufacturer.

2.2 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 E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.3 GYPSUM VENEER PLASTER

A. One-Component Gypsum Veneer Plaster: ASTM C 587, ready-mixed, smooth, finish-coat veneer plaster formulated for application directly over substrate without use of separate base-coat material.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Georgia-Pacific Building Products.
   c. United States Gypsum Company.

2.4 PANEL PRODUCTS
   A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.
   B. Gypsum Base for Veneer Plaster: ASTM C 1396/C 1396M.
      1. Thickness: 1/2 inch.
   C. Gypsum Base for Veneer Plaster, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistant capability.
      1. Thickness: 1/2 inch.

2.5 TRIM ACCESSORIES
   A. Standard Trim: ASTM C 1047, provided or approved by manufacturer for use in gypsum veneer plaster applications indicated.
      1. Material: Galvanized-steel sheet or aluminum-coated steel sheet or rolled zinc.
      2. Shapes:
         a. Cornerbead.
         b. LC-Bead: J-shaped; exposed long flange receives veneer plaster.
         c. L-Bead: L-shaped; exposed long flange receives veneer plaster.

2.6 JOINT REINFORCING MATERIALS
   A. General: Comply with joint strength requirements in ASTM C 587 and with gypsum veneer plaster manufacturer's written recommendations for each application indicated.
   B. Joint Tape:
      1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for applications indicated.
      2. Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.
   C. Embedding Material for Joint Tape:
      1. Gypsum Base for Veneer Plaster: As recommended by gypsum veneer plaster manufacturer for use with joint-tape material and gypsum veneer plaster applications indicated.

2.7 AUXILIARY MATERIALS
   A. General: Provide auxiliary materials that comply with referenced product standards and manufacturer's written recommendations.
   B. Steel Drill Screws: ASTM C 1002.
C. Sound Attenuation Blankets: ASTM C 665, 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: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 843. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

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 panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING PANELS, GENERAL

A. Gypsum Base for Veneer Plaster: Apply according to ASTM C 844 unless manufacturer's written recommendations are more stringent.
   1. Do not allow gypsum base to degrade from exposure to sunlight, as evidenced by fading of paper facing.
   2. Erection Tolerance: No more than 1/16-inch offsets between planes of gypsum base panels, and 1/8 inch in 8 feet noncumulative, for level, plumb, warp, and bow.

B. Install sound attenuation blankets before installing gypsum base for veneer plaster.

C. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. 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.

E. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or 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 locate joints, other than control joints, at corners of framed openings.

F. Attach panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach panels to framing provided at openings and cutouts.

H. Form control joints with space between edges of adjoining panels.
I. Cover both sides of partition framing with panels in concealed spaces, including above ceilings, except in internally braced chases.
   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 panels around ducts, pipes, and conduits.

J. Wood Framing: Install panels over wood framing, with "floating" internal corner construction. Do not attach panels across the flat grain of wide-dimension lumber, including floor joists and headers. "Float" panels over these members or provide control joints to counteract wood shrinkage.

K. STC-Rated 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 C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

L. Fastener Spacing: Comply with ASTM C 844, manufacturer's written recommendations, and fire-resistance-rating requirements.
   1. Space screws a maximum of 12 inches o.c. along framing members for wall or ceiling application.

3.3 INSTALLING PANELS

A. Install panels for veneer plaster in locations indicated on Drawings.

B. Single-Layer Application:
   1. On ceilings, apply gypsum base panels before wall panels, to the greatest extent possible and at right angles to framing unless otherwise indicated.
   2. On walls, apply gypsum base panels vertically and 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 install gypsum base panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

C. Fasteners: Drive fasteners flush with gypsum base surface. Do not overdrive fasteners or cause surface depressions.

D. Single-Layer Fastening Methods: Apply gypsum base panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

A. Install trim with back flanges intended for fasteners, and attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners.
   2. LC-Bead: Use at exposed panel edges.
   3. L-Bead: Use where indicated.
3.5 INSTALLING JOINT REINFORCEMENT

A. Gypsum Base: Reinforce interior angles and flat joints with joint tape and embedding material to comply with ASTM C 843 and with gypsum veneer plaster manufacturer's written recommendations.

3.6 GYPSUM VENEER PLASTERING

A. Gypsum Veneer Plaster Mixing: Mechanically mix gypsum veneer plaster materials to comply with ASTM C 843 and with gypsum veneer plaster manufacturer's written recommendations.

B. Gypsum Veneer Plaster Application: Comply with ASTM C 843 and with veneer plaster manufacturer's written recommendations.
   1. One-Component Gypsum Veneer Plaster: Trowel apply base coat over substrate to uniform thickness. Fill all voids and imperfections. Immediately double back with same mixer batch of plaster to a uniform total thickness of 1/16 to 3/32 inch.
   2. Where gypsum veneer plaster abuts only metal door frames, windows, and other units, groove finish coat to eliminate spalling.
   3. Do not apply veneer plaster to gypsum base if paper facing has degraded from exposure to sunlight. Before applying veneer plaster, use remedial methods to restore bonding capability to degraded paper facing according to manufacturer's written recommendations.

C. Concealed Surfaces: Do not omit gypsum veneer plaster behind cabinets, furniture, furnishings, and similar removable items.


3.7 PROTECTION

A. Protect installed gypsum veneer plaster from damage from weather, condensation, construction, and other causes during remainder of the construction period.

B. Remove and replace gypsum veneer plaster and gypsum base panels that are wet, moisture damaged, or mold damaged.
   1. Indications that gypsum base panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that gypsum base panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION
SECTION 09 2900

GYPSUM BOARD

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 interior gypsum board.

B. Related Requirements:
   1. Section 06 1000 "Rough Carpentry" for wood framing.
   2. Section 07 8413 "Penetration Firestopping" for firestopping through penetrations in fire-rated gypsum partitions.
   3. Section 07 8443 "Joint Firestopping" for firestopping perimeter joints in fire-rated gypsum partitions.
   4. Section 09 2613 "Gypsum Veneer Plastering" for gypsum base for veneer plaster and for other components of gypsum-veneer-plaster finishes.
   5. Section 09 9100 "Painting" for field painting gypsum board.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.

1.4 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.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 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 E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following or equal:
   1. American Gypsum.
   2. CertainTeed Corp.
   3. Georgia-Pacific Gypsum LLC.
   4. Lafarge North America Inc.
   6. USG Corporation.

B. 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 Wallboard: ASTM C 1396/C 1396M.
   1. Thickness: 1/2 inch.
   2. Long Edges: Tapered.

2.4 SPECIALTY GYPSUM BOARD

A. Gypsum Board, Type C: ASTM C 1396/C 1396M. Manufactured to have increased fire-resistant capability.
   1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
   2. Long Edges: Tapered.
2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   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.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape: Paper.

C. Joint Compound: 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.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. Steel Drill Screws: ASTM C 1002.

C. Sound-Attenuation Blankets: ASTM C 665, 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: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following or equal:
      a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
      b. Grabber Construction Products; Acoustical Sealant GSC.
      c. Pecora Corporation; AC-20 FTR or AIS-919.
      e. USG Corporation; SHEETROCK Acoustical Sealant.
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.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

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. Cover both faces of support framing with gypsum panels in concealed spaces, 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.

F. 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.

G. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

H. STC-Rated 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 C 919 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.

I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
1. Wallboard Type: As indicated on Drawings.
2. Type C: Where required for specific fire-resistance-rated assembly indicated.

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.

3.4 INSTALLING TRIM ACCESSORIES

A. 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. Interior Trim: Install in the following locations:
1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.

3.5 FINISHING GYPSUM BOARD

A. 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 C 840:
1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view.
   a. Primer and its application to surfaces are specified in Section 09 9100 "Painting."
3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair 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
SECTION 09 6519.53
ENGINEERED COMPOSITE VINYL TILE FLOORING

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 interlocking, composite vinyl tile flooring with solid vinyl facing, composite core and sound control backing.
B. Related Requirements:
   1. Section 06 2023 "Interior Finish Carpentry" for wood base.

1.3 ACTION SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Product Data: For each type of product.
C. Samples for Verification: For each type of composite vinyl flooring and accessory, with color and finish required, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 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. Composite vinyl Flooring: Equal to 1 percent of amount installed for each type, color, and finish of flooring indicated.

1.5 QUALITY ASSURANCE
A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
   1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver composite vinyl flooring materials in unopened cartons or bundles.

B. Protect composite vinyl flooring from exposure to moisture. Do not deliver composite vinyl flooring until after plaster and similar wet-work is complete and dry.

C. Store composite vinyl flooring materials in a dry, warm, ventilated, weathertight location.

1.7 FIELD CONDITIONS

A. Conditioning period begins not less than seven days before flooring installation, is continuous through installation, and continues not less than seven days after flooring installation.
   1. Environmental Conditioning: Maintain ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive flooring during the conditioning period.

B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

C. Install composite vinyl flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 ENGINEERED COMPOSITE VINYL FLOORING

A. Basis-of-Design: Subject to compliance with requirements, provide the following products where indicated on Drawings:
   1. Wood Lam Flooring: USFloors, Inc.; COREtec Plus, Rocky Mountain Oak, No. 50LVP207.

B. Engineered Composite Vinyl Flooring
   1. Thickness: 8 mm.
   2. Construction: Three ply.
   3. Face Dimensions:
      a. Wood Lam Flooring: 5 by 48 inches.
      b. Tile Lam Flooring: 12 by 24 inches.
   4. Facing: 1.5-mm virgin PVC (0.5 mm/20 mil wear layer).
   5. Core: 5-mm extruded composite core, composed of wood dust, bamboo dust, limestone and virgin PVC.
   6. Backing: 1.5-mm cork.
   7. Finish: 2 coat UV cured acrylic.

2.2 ACCESSORY MATERIALS

A. Thresholds and Saddles: To match flooring. Tapered on each side.
B. Reducer Strips: To match flooring. 2 inches wide, tapered, and in thickness required to match height of flooring.

C. Expansion Strip: Cork strip or silicone sealant as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Concrete Slabs:
   1. Grind high spots and fill low spots to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
   2. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with flooring manufacturer's written installation instructions.

B. Provide expansion space at walls and other obstructions and terminations of flooring of not less than 1/4 inch.

C. Engineered Composite Vinyl Flooring: Install floating floor.

3.4 PROTECTION

A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.
   1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION
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 surface preparation and the application of paint systems on interior and exterior substrates.

B. Related Requirements:
   1. Section 09 9300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product. Include preparation requirements and application instructions.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   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.

D. 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.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For paints and coatings to include in maintenance manuals.
   1. Coating Maintenance Manual: Provide a coating maintenance manual, such as Sherwin-Williams’ “Custodian Project Color and Product Information” report or equal. Coating maintenance manual shall include:
      a. Area Summary with finish schedule.
      b. Area Detail designating where each product/color/finish was used.
      c. Product data pages.
d. Material Safety Data Sheets.
e. Care and cleaning instructions.
f. Touch-up procedures.
g. Color samples of each color and finish used.

1.5 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: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 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.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to one of the following or equal:
   2. PPG Architectural Coatings, Inc. (PPG).
   3. The Sherwin-Williams Company (S-W).

B. Products: Subject to compliance with requirements, provide one of the products listed, for each of the paint categories indicated in the Part 3 Articles.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
1. Provide materials for use within each paint 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 paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

D. Colors: As selected by Architect from manufacturer's full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.

2. Testing agency will perform tests for compliance with product requirements.

3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

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.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

F. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.
3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. 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 if any.

C. Clean substrates of substances that could impair bond of paints, 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 paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or 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.

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 fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. Aluminum Substrates: Remove loose surface oxidation.

J. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
1. Use applicators and techniques suited for paint 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 front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in occupied spaces, or exposed to view at exterior areas:
      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 other paintable jacket material.
      h. Other items as directed by Architect.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may 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 paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, 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 painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:
   1. Latex System:
      a. Prime Coat: Primer sealer, latex, interior, MPI #50.
         1) Moore; Eco Spec WB, Interior Latex Primer, N372/F372.
         2) PPG; Speedhide Zero, Interior Zero VOC Latex Sealer, 6-4900XI.
         3) S-W; ProMar 200 Zero, Interior Latex Primer, B28W02600/B28WQ2600.
      c. Topcoat: Latex, interior, (Gloss Level 2), MPI #44.
         1) Moore; Ultra Spec 500, Waterborne Interior Low Sheen Finish, N537/K537.
         2) PPG; Speedhide Zero, SPEEDHIDE zero Interior Zero VOC Latex Eggshell, 6-4310XI.
         3) S-W; ProMar 200 Zero VOC, Interior Latex Low Sheen, B24W02651/B24WQ2651.

B. CMU Substrates:
   1. Latex System:
      a. Block Filler: Block filler, latex, interior/exterior, MPI #4 X-Green.
         1) Moore; Super Spec, High Build Interior/Exterior Block Filler, 206/K206.
         2) PPG; Glidden Professional (US), Concrete Coatings Block Filler Interior/Exterior Primer, 3010.
         3) S-W; PrepRite, Int/Ext Block Filler, B25W00025/B25WQ8025.
      c. Topcoat: Latex, interior, (Gloss Level 2), MPI #44.
         1) Moore; Ultra Spec 500, Waterborne Interior Low Sheen Finish, N537/K537.
         2) PPG; Speedhide Zero, SPEEDHIDE zero Interior Zero VOC Latex Eggshell, 6-4310XI.
         3) S-W; ProMar 200 Zero VOC, Interior Latex Low Sheen, B24W02651/B24WQ2651.

C. Steel Substrates:
   1. Latex over Alkyd Primer System:
      a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
         2) PPG; Speedhide, Int/Ext Rust Inhibitive Metal Primer, 6-212.
3) S-W; Protective & Marine, kem Bond HS, B50WZ4.


c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54 X-Green.

1) Moore; Eco Spec WB, Interior Latex Semi-Gloss Finish, N376/K376.

2) PPG; SPEEDHIDE zero Interior Zero VOC Latex Semi-Gloss, 6-4510XI.

3) S-W; Emerald, Emerald Interior Acrylic Latex Semi-Gloss, K38W00351.

D. Galvanized-Metal Substrates:

1. Latex System:

a. Prime Coat: Primer, galvanized, water based, MPI #134.

1) Moore; Super Spec HP, Acrylic Metal Primer, P04/KP04.

2) PPG; Pitt-Tech Plus, 100% Acrylic DTM Industrial Primer, 90-912.

3) S-W; Pro Industrial, Pro-Cryl Universal Primer, B66W310.


c. Topcoat: Latex, interior, (Gloss Level 2), MPI #44.

1) Moore; Ultra Spec 500, Waterborne Interior Low Sheen Finish, N537/K537.

2) PPG; Speedhide Zero, SPEEDHIDE zero Interior Zero VOC Latex Eggshell, 6-4310XI.

3) S-W; ProMar 200 Zero VOC, Interior Latex Low Sheen, B24W02651/B24WQ2651.

E. Wood Substrates (Opaque Finish):

1. Latex System:

a. Prime Coat: Primer, latex, for interior wood, MPI #39.

1) Moore; Ins-i-x, Aqua Lock Plus Acrylic Primer Sealer, AQ-0400.

2) S-W; PrepRite ProBlock, Primer Sealer, B51W00620.

3) Vista Paint; Vista Aqua Lac, Aqua Lac, 6600.


c. Topcoat: Latex, interior, semi-gloss, (Gloss Level 5), MPI #54.

1) Moore; Eco Spec WB, Interior Latex Semi-Gloss Enamel, N376/F376.

2) PPG; SPEEDHIDE zero Interior Zero VOC Latex Semi-Gloss, 6-4510XI.

3) S-W; ProMar 200 Zero VOC, Interior Latex Low Sheen, B24W02651/B24WQ2651.

F. Gypsum Board and Veneer Plaster Wall Substrates:

1. Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green.

1) Moore; Eco Spec WB, Interior Latex Primer, N372/F372.

2) PPG; Speedhide Zero, Interior Zero VOC Latex Sealer, 6-4900XI.

3) S-W; ProMar 200 Zero, Interior Latex Primer, B28W02600/B28WQ2600.


c. Topcoat: Latex, interior, (Gloss Level 2), MPI #44 X-Green.

1) Moore; Super Hide, Zero VOC Interior Low-Sheen, 356.

2) PPG; PPG Paints, Speedhide Zero Interior Zero VOC Latex Eggshell, 6-4310XI.

3) S-W; ProMar 200 Zero VOC, Interior Latex Low Sheen, B24W02651/B24WQ2651.

G. Gypsum Board and Veneer Plaster Ceiling Substrates:

1. Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50 X-Green.
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1) Moore; Eco Spec WB, Interior Latex Primer, N372/F372.
2) PPG; Speedhide Zero, Interior Zero VOC Latex Sealer, 6-4900XI.
3) S-W; ProMar 200 Zero, Interior Latex Primer, B28W02600/B28WQ2600.
c. Topcoat: Latex, interior, flat, (Gloss Level 1), MPI #53 X-Green.
1) Moore; Eco Spec WB, Interior Latex Flat Finish, N373/F373.
2) PPG; Speedhide Zero, Interior Zero VOC Latex Flat, 6-4110XI.
3) S-W; ProMar 200 Zero VOC, Interior Latex Flat, B30W02651/B30WQ2651.

3.7 EXTERIOR PAINTING SCHEDULE

A. CMU Substrates:
1. Latex System:
   a. Block Filler: Block filler, latex, interior/exterior, MPI #4 X-Green.
      1) Moore; Super Spec, High Build Interior/Exterior Block Filler, 206/K206.
      2) PPG; Glidden Professional (US), Concrete Coatings Block Filler Interior/Exterior Primer, 3010.
      3) S-W; PrepRite, Int/Ext Block Filler, B25W00025/B25WQ8025.
      a. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.
         1) Moore; Ultra Spec, Exterior Flat Finish, N447/K447.
         2) PPG; PPG, Speedhide Exterior 100% Acrylic Latex Flat, 6-610XI Line.
         3) S-W; Weatherclad, 100% Acrylic Exterior Flat, B02WF0851/B02WQ8851.

B. Steel Substrates:
1. Alkyd System:
   a. Prime Coat: Primer, alkyd, anti-corrosive, for metal, MPI #79.
      2) PPG; Speed Hide, Int/Ext Rust Inhibitive Metal Primer, 6-212.
      3) S-W; Protective & Marine, kem Bond HS , B50WZ4.
   c. Topcoat: Alkyd, exterior, gloss (Gloss Level 6), MPI #9.
      1) Moore; Insi-x, Silathane Alkyd Gloss Enamel, SP520-52.
      2) PPG; Devoe Coatings (US), DEVGUARD 4308 Alkyd Gloss Industrial Enamel, 4308.
      3) S-W; Protective & Marine, Seaguard 1000 Marine, N41W00620.

C. Galvanized-Metal Substrates:
1. Alkyd System:
   a. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.
   c. Topcoat: Alkyd, exterior, gloss (Gloss Level 6), MPI #9.
      1) Moore; Insi-x, Silathane Alkyd Gloss Enamel, SP520-52.
      2) Rust-Oleum; CV740 System, DTM Alkyd Enamel, 255614.
      3) S-W; Protective & Marine, Seaguard 1000 Marine, N41W00620.

D. Wood Substrates:
1. Latex System:
1) Moore; Insi-x, Blockout Acrylic House Paint Primer, TB-1100.
2) PPG; PPG, Seal Grip Universal Primer/Sealer, 17-921.
3) S-W; PrepRite ProBlock, Interior/Exterior Latex Primer/Sealer, B51W00620.
   c. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
      1) Moore; Ultra Spec, Exterior Satin Finish, N448/K448.
      2) PPG; PPG, Speedhide Exterior 100% Acrylic Latex Satin, 6-2045XI Line.
      3) S-W; Weatherclad, 100% Acrylic Exterior Satin, B12WF0851.

E. Plastic Trim Fabrication Substrates:
   1. Latex System:
      a. Prime Coat: Primer, bonding, water based, MPI #17.
      c. Topcoat: Latex, exterior, low sheen (Gloss Level 3-4), MPI #15.
         1) Moore; Ultra Spec, Exterior Satin Finish, N448/K448.
         2) PPG; PPG, Speedhide Exterior 100% Acrylic Latex Satin, 6-2045XI Line.
         3) S-W; Weatherclad, 100% Acrylic Exterior Satin, B12WF0851.

END OF SECTION
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 panel signs.

B. Related Requirements:
   1. Section 015000 "Temporary Facilities and Controls" for temporary Project identification signs and for temporary information and directional signs.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product.

C. Samples for Verification: For each type of sign assembly showing all components and with the required finishes, in manufacturer's standard size unless otherwise indicated and as follows:
   1. Panel Signs: Full-size Sample.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS


2.2 SIGNS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or equal:
   1. Advance Corporation; Braille-Tac Division.
   2. ASI Sign Systems, Inc.
   3. Best Sign Systems Inc.
B. Panel Sign: Sign with smooth, uniform surfaces; with message and characters having uniform
designed faces, sharp corners, and precisely formed lines and profiles; and as follows:
2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated to
acrylic or phenolic backing sheet to produce composite sheet.
   a. Composite-Sheet Thickness: 0.125 inch.
   a. Edge Condition: Square cut.
   b. Corner Condition in Elevation: Square.
4. Mounting: Surface mounted to wall with adhesive or two-face tape.
5. Surface Finish and Applied Graphics:
   a. Integral Acrylic Sheet Color: As selected by Architect from full range of industry
colors.
6. Text and Typeface: Accessible raised characters and Braille. Finish raised characters to
contrast with background color, and finish Braille to match background color.

2.3 ACCESSORIES

A. Adhesives: As recommended by sign manufacturer and with a VOC content of 70 g/L or less
for adhesives used inside the weatherproofing system and applied on-site when calculated
according to 40 CFR 59, Subpart D (EPA Method 24).

B. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with
adhesive on both sides.

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.

3.2 INSTALLATION

A. 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.

B. Mounting Methods:
   1. 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.

2. 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.

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
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SECTION 10 2800

TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes private-use bathroom accessories.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”

B. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.

C. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
   1. Approved full-size Samples will be returned and may be used in the Work.

D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
1.6 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and applicable provisions in 521 CMR, Massachusetts Architectural Access Board (AAB), for toilet accessories designated as accessible.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.


F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

2.3 PRIVATE-USE BATHROOM ACCESSORIES

A. Basis-of-Design Products: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following or equal:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.

B. Toilet Tissue Dispenser:

1. Basis-of-Design Product: As indicated on Drawings.
2. **Description:** Single-roll dispenser.
3. **Mounting:** Recessed.
4. **Capacity:** Designed for 5-inch-diameter tissue rolls.
5. **Material and Finish:** Stainless steel, No. 4 finish (satin).

**C. Towel Bar:**
1. **Basis-of-Design Product:** As indicated on Drawings.
2. **Description:** 1-inch round tube with circular end brackets.
3. **Mounting:** Flanges with concealed fasteners.
4. **Length:** 24 inches.
5. **Material and Finish:** Stainless steel, No. 4 finish (satin).

**D. Robe Hook:**
1. **Basis-of-Design Product:** As indicated on Drawings.
2. **Description:** Single-prong unit.
3. **Material and Finish:** Stainless steel, No. 4 finish (satin).

**E. Grab Bars:**
1. **Basis-of-Design Product:** As indicated on Drawings.
2. **Mounting:** Flanges with concealed fasteners.
3. **Material:** Stainless steel, 0.05 inch thick.
   a. **Finish:** Smooth, No. 4 finish (satin)[ on ends and slip-resistant texture in grip area].
4. **Configuration and Length:** As indicated on Drawings.

**F. Shower Curtain Rods:**
1. **Basis-of-Design Product:** As indicated on Drawings.
2. **Outside Diameter:** 1 inch.
3. **Mounting:** Flanges with concealed fasteners.
4. **Rod Material and Finish:** Stainless steel, No. 4 finish (satin).
5. **Flange Material and Finish:** Stainless steel, No. 4 finish (satin).

**2.4 FABRICATION**

**A.** Fabricate units with tight seams and joints, and exposed edges rolled. Equip units for concealed anchorage and with corrosion-resistant backing plates.

**PART 3 - EXECUTION**

**3.1 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 withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.
3.2 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 recommendations.

END OF SECTION
SECTION 11 3100
RESIDENTIAL APPLIANCES

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:
   2. Kitchen exhaust ventilation.
B. Related Sections:
   1. Section 06 4000 “Architectural Woodwork” for custom manufactured kitchen casework and countertops.
   2. Section 26 0000 “Electrical” for electrical service to residential appliances.

1.3 ACTION SUBMITTALS
A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, dimensions, furnished accessories, and finishes for each appliance.
C. Product Schedule: For appliances. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.
B. Product Certificates: For each type of appliance, from manufacturer.
C. Field quality-control reports.
D. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS
A. Operation and Maintenance Data: For each residential appliance to include in operation and maintenance manuals.
1.6 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain residential appliances from single source.

C. Regulatory Requirements: Comply with the following:
   1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1 and with the Commonwealth of Massachusetts Regulation 521 CMR, Architectural Access Board, as amended.

E. Preinstallation Conference: Conduct conference at Project site.

1.7 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period except as qualified below:
   1. Warranty Period: Two years from date of Substantial Completion.

B. Refrigerator/Freezer, Sealed System: Full warranty including parts and labor for on-site service on the product.
   1. Warranty Period for Sealed Refrigeration System: Five years from date of Substantial Completion.
   2. Warranty Period for Other Components: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on the Drawings or a comparable product by one of the following or equal:
   2. KitchenAid; a division of Whirlpool Corporation.
   3. LG Appliances.
   4. Maytag; a division of Whirlpool Corporation.
   5. Whirlpool Corporation.

2.2 COOKTOPS

A. Electric Cooktop (CT 1):
   2. Width: 30 inches.
4. Electric Power Supply: 240 V, 60 Hz, 1 phase, 30 A.
5. Top Material: Manufacturer's standard.

2.3 WALL OVENS

A. Electric Wall Oven (WO 1): One-oven unit.

2.4 KITCHEN EXHAUST VENTILATION

A. Overhead Exhaust Hood (H-1):
   2. Type: Wall-mounted, exhaust-hood system.
   3. Finish: Baked enamel.

2.5 REFRIGERATOR/FREEZERS

A. Refrigerator/Freezer (R-1): Two-door refrigerator/freezer complying with AHAM HRF-1.
   2. Type: Freestanding.

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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before appliance installation.

RESIDENTIAL APPLIANCES
11 3100 - 3
C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

D. Utilities: Comply with plumbing and electrical requirements.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:
   1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer’s appliance-performance parameters.
   2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
   3. Operational Test: After installation, start units to confirm proper operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. An appliance will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION
SECTON 12 3530
RESIDENTIAL CASEWORK

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 kitchen cabinets and bathroom vanities.
   B. Related Requirements:
      1. Section 12 3661.16 “Solid Surfacing Countertops” for countertops in kitchens and
         bathrooms.

1.3 DEFINITIONS
   A. MDF: Medium-density fiberboard.
   B. Exposed Surfaces of Cabinets: Surfaces visible when doors and drawers are closed, including
      visible surfaces in open cabinets or behind glass doors.
   C. Semiexposed Surfaces of Cabinets: Surfaces behind opaque doors or drawer fronts, including
      interior faces of doors, interiors and sides of drawers, and bottoms of wall cabinets.
   D. Concealed Surfaces of Cabinets: Surfaces not usually visible after installation, including
      sleepers, web frames, dust panels, bottoms of drawers, ends of cabinets installed directly
      against and completely concealed by walls or other cabinets, and tops of wall cabinets and
      utility cabinets.

1.4 ACTION SUBMITTALS
   A. Make Submittals in accordance with Section 01 3300 “Submittal Procedures.”
   B. Product Data: For the following:
      1. Cabinets.
      2. Cabinet hardware.
   C. Shop Drawings: Include plans, elevations, details, and attachments to other work. Show
      materials, finishes, filler panels, and hardware.
   D. Samples for Verification: 8-by-10-inch Samples for each type of finish and the following:
      1. Exposed hardware, for each type of item.
2. One full-size, 16 inches wide, finished base cabinet complete with hardware, doors, and drawers but without countertop.
3. One full-size, 12 inches wide, finished wall cabinet complete with hardware, doors, and adjustable shelves.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For manufacturer.
B. Product Certificates: For residential casework.

1.6 FIELD CONDITIONS
A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete and dry, and temporary HVAC system is operating and maintaining temperature and humidity conditions at occupancy levels during the remainder of the construction period.
B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.

1.7 COORDINATION
A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

PART 2 - PRODUCTS

2.1 CABINETS
A. Quality Standard: Provide cabinets that comply with KCMA A161.1.
   1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.
B. Face Style: Flush overlay; door and drawer faces cover cabinet fronts with only enough space between faces for operating clearance.
C. Cabinet Style: Frameless.
D. Door and Drawer Fronts: 1/2-inch-thick, plastic-laminate-faced particleboard with PVC edgebanding.
E. Exposed Cabinet End Finish: Plastic laminate.
F. Cabinet End Construction: 5/8-inch-thick particleboard or 1/2-inch-thick plywood.
G. Cabinet Tops and Bottoms: 3/4-inch-thick plywood, fully supported by and secured in rabbets in end panels and back rail.

H. Back, Top, and Bottom Rails: 3-1/2-inch solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.

I. Wall-Hung-Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.

J. Base-Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.

K. Front Frame Drawer Rails: 3/4-by-1-1/4-inch solid wood mortised and fastened into face frame.

L. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join subfronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.
   2. Subfronts, Backs, and Sides: 1/2-inch-thick solid wood.

M. Shelves: 3/4-inch-thick particleboard.

N. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.

2.2 CABINET MATERIALS

A. General:
   1. Hardwood Lumber: Kiln dried to 7 percent moisture content.
   2. Softwood Lumber: Kiln dried to 10 percent moisture content.
   3. Hardwood Plywood: HPVA HP-1; made with adhesive containing no urea formaldehyde.
   4. Particleboard: ANSI A208.1, Grade M-2; made with binder containing no urea formaldehyde.
   5. MDF: ANSI A208.2, Grade MD; made with binder containing no urea formaldehyde.

B. Exposed Materials:
   1. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD 3, Grade VGS.
      a. Colors, Textures, and Patterns: As selected by Architect from cabinet manufacturer's full range.
   2. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper.
      a. Colors: As selected by Architect from cabinet manufacturer's full range.
   3. PVC Edge Molding: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, and 1 mm thick elsewhere.
      a. Color: As selected by Architect from cabinet manufacturer's full range.
C. Semiexposed Materials: Unless otherwise indicated, provide the following:
   1. Plastic Laminate: Particleboard faced with high-pressure decorative laminate complying with NEMA LD 3, Grade VGS.
      a. For backs of doors and drawer fronts faced with plastic laminate, provide same grade, pattern, color, and texture of plastic laminate as for faces.
      b. For shelves faced with plastic laminate, provide plastic-laminate edges of same grade, pattern, color, and texture of plastic laminate as for faces or PVC edge molding of 1 mm thick.
      c. Colors, Textures, and Patterns: As selected by Architect from cabinet manufacturer's full range.
   2. Thermoset Decorative Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper.
      a. Provide material finished on both sides for shelves, dividers, drawer bodies, and other components with two semiexposed surfaces.
      b. Provide PVC or polyester edgebanding on components with semiexposed edges.
      c. Colors: As selected by Architect from cabinet manufacturer's full range.

D. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; MDF; or hardboard.

2.3 CABINET HARDWARE

A. Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.

B. Pulls: Wire pulls.

C. Hinges: Concealed European-style, self-closing hinges.

D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or Type B05091.

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 casework.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.
B. Install cabinets without distortion so doors and drawers fit the openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.

C. Install cabinets level and plumb to a tolerance of 1/8 inch in 8 feet.

D. Fasten cabinets to adjacent units and to backing.
   1. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION
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SECTION 12 3661.16

SOLID SURFACING COUNTERTOPS

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. Solid surface material countertops.
   2. Solid surface material backsplashes.
   3. Solid surface material end splashes.
   4. Solid surface material apron fronts.
   5. Solid surface material sinks.

B. Related Requirements:
   1. Section 12 3530 "Residential Casework" for base cabinets and vanities.
   2. Section 22 0000 "Plumbing" for nonintegral sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

A. Make Submittals in accordance with Section 01 3300 "Submittal Procedures."

B. Product Data: For countertop materials and sinks.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
   1. Show locations and details of joints.
   2. Show direction of directional pattern, if any.

D. Samples for Verification: For the following products:
   1. Countertop material, 6 inches square.
   2. Wood trim, 8 inches long.
   3. One full-size solid surface material countertop, with front edge[ and backsplash], 8 by 10 inches, of construction and in configuration specified.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.
1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of countertops.

C. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
   1. Build mockup of typical countertop as shown on Drawings.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

1.8 COORDINATION

A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following or equal:
      a. Avonite Surfaces.
      c. Formica Corporation.
      d. LG Chemical, Ltd.
      e. Meganite Inc.
      f. Samsung Chemical USA, Inc.
      g. Swan Corporation (The).
      h. Wilsonart LLC.
   2. Type: Provide Standard type unless Special Purpose type is indicated.
   4. Colors and Patterns: As selected by Architect from manufacturer's full range.
2.2 COUNTERTOP FABRICATION

A. Fabricate countertops according to solid surface material manufacturer's written instructions.

B. Configuration:
   1. Front: Straight, slightly eased at top.
   2. Backsplash: Straight, slightly eased at corner.

C. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material.

D. Backsplashes: 1/2-inch-thick, solid surface material.

E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   1. Fabricate with loose backsplashes for field assembly.
   2. Install integral sink bowls in countertops in the shop.

F. Joints: Fabricate countertops without joints.

G. Cutouts and Holes:
   1. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

2.3 INSTALLATION MATERIALS

A. Adhesive: Product recommended by solid surface material manufacturer.

B. Sealant for Countertops: Comply with applicable requirements in Section 07 9200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
B. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. 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.

C. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.

D. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.

F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

G. Apply sealant to gaps at walls; comply with Section 07 9200 "Joint Sealants."

END OF SECTION
SECTION 22 0000

PLUMBING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. A complete domestic cold water system throughout the building. The system shall originate at a connection to a new main 10'0" outside of the building and extend to every fixture, piece of equipment or outlet requiring cold water. The cold water system to each individual unit shall be provided with a water meter with remote reader provide for owners use.

2. A complete domestic hot water system individual to each Unit. The system shall originate with the gas fired combination boiler/domestic water heater (provided and installed by HVAC contractor with plumber installing the plumbing piping and associated valves) and extend to all plumbing fixtures and equipment requiring domestic hot water.

3. A complete sanitary, waste and vent system throughout the entire building connecting to each and every fixture and piece of equipment requiring sanitary drainage. This system shall extend and connect to the sanitary main 10'0" outside of the building. Vents shall extend through the roof.

4. A complete natural gas system throughout the building connecting to each and every appliance requiring gas. Each unit shall be provided with it’s own meter and individual gas system. These systems shall extend and connect to the house side of the meter provided by the Utility Company. Make all necessary arrangements and pay all costs for the new exterior gas service and meter for this project. It shall be the plumbers responsibility to contact the gas company and attain all gas information from the supplying gas company before beginning their work.

5. All plumbing fixtures as specified herein including their trim, faucets and carriers.

6. All roughing and final connections to fixtures, specialties and equipment specified in this project.

7. Pipe insulation.

8. All pipe hangers, clamps, rods, supports, sleeves, inserts, escutcheons and access panels.
9. Backflow preventers
10. Water meter and accessories
11. Hose bibbs and wall hydrants (150’-0” on center – coordinate location with architect)
12. Service water and waste connections for equipment provided under other sections.
13. Cleaning, testing and disinfection.
14. All supplementary steel for piping and equipment.
15. Guarantees
16. Vibration isolation and flexible connections
17. System and equipment identification.
18. System and equipment start-up and instructions
19. Operating and Maintenance Manuals
20. Thrust blocks and related supports and restraints.
21. Final connections to all utility lines.
22. Testing of all plumbing systems required.
23. Backcharges from all utility companies. [gas service and gas meter - by building owner]
26. Record Drawings.

B. Items to be Furnished Only: Furnish following items for installation under designated Section: Not Applicable.

C. Items to be Installed only: Install the following items as furnished by the designated Sections: NONE

D. Related Work: The following items are not included in this section and will be performed under the designated sections and as indicated below:

1. SECTION 01045 - CUTTING AND PATCHING
   a. Coring, cutting and patching [except drilling for hangers and providing openings in metal decks]. However, this work shall be paid for by the Plumbing Contractor where this is due to his omissions or negligence.
2. SECTION 01500 - TEMPORARY FACILITIES
   a. Temporary heat, light, water, power and sanitary facilities for use during construction and testing.
   b. The General Contractor shall provide all scaffolding and staging above eight [8] feet.

3. SECTION 02200 - EARTHWORK
   a. Excavation and backfilling for all underground piping and structures.

4. SECTION 02700 – SANITARY SEWER
   a. Utilities [such as sanitary and water] beyond point indicated on the drawings from the building walls.
   b. Site drainage
   c. Utility Structures

5. SECTION 03300 – CAST-IN-PLACE CONCRETE
   a. Pads, concrete bases and form work.

6. SECTION 06100 - ROUGH CARPENTRY
   a. Wood blocking and grounds

7. SECTION 07270 - FIRE STOPPING
   a. All firestopping where required around plumbing pipes.

8. SECTION 09900 - PAINTING
   a. Painting of all exposed plumbing equipment not having enameled surfaces, stainless steel or chromed finishes.

9. SECTION 15300 - FIRE PROTECTION
   a. Fire service piping
   b. Sprinkler drains
10. SECTION 15500 - HEATING, VENTILATING AND AIR CONDITIONING
   a. Extension of city water piping and fittings including insulation, connecting to HVAC equipment.

11. SECTION 16100 - ELECTRICAL
   a. All power wiring of every description to be provided under 16100 Electrical. All starters and controllers for mechanical equipment, except where provided as integral with mechanical equipment, shall be provided under SECTION 16100 Electrical.

1.3 INTENT
   A. All work shown on the Drawings is intended to be approximately correct to scale, but figured dimensions and detailed Drawings are to be followed in every case. The Drawings shall be taken in a sense as diagrammatic. Size of pipes or conduits and methods of running them are shown but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered.

   B. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete, approved working systems ready for use shall be furnished without extra charge.

   C. Locations shown on the Drawings are approximate and it is intended that all equipment shall be located in accordance with the general and detail Drawings of the construction proper. All measurements shall be taken at the building before fabrication commences.

1.4 QUALITY ASSURANCE
   A. The work shall be executed in strict conformity with the latest edition of the prevailing State Plumbing and Building Codes and all local regulations that may apply. In case of conflict between the contract documents and a governing code or ordinance, the more stringent standard shall apply.

   B. Unless otherwise specified or indicated, materials and workmanship shall conform with the latest edition of the following Standards and Specifications:

      American National Standards Institute (ANSI)
      Underwriter's Laboratories, Inc. (UL)
      American Society for Testing and Materials (ASTM)
      National Fire Protection Association (NFPA)
      American Gas Association (AGA)
      National Electric Code (NEC)
      Department of Environmental Protection (DEP)

   C. If any work is performed and subsequent changes are necessary to conform to the ordinances, the changes shall be made at the Plumbing Subcontractor's expense.
D. All new plumbing equipment shall be designed to conform to applicable state and local energy codes. Pipe insulation, and flow control fittings shall be selected with efficiencies and design conditions to meet applicable energy codes.

E. Availability of a "Certificate of Approval" from the local and/or state Plumbing Inspector shall be a prerequisite to scheduling a final inspection to this contract. A copy of the certificate shall be submitted to the Designer.

F. Workmanship shall be of the best quality and none but competent workmen skilled in their trades shall be employed. The Plumbing Subcontractor shall furnish the services of an experienced superintendent, who will be constantly in charge of the erection of the work, until completed and accepted.

G. Obtain from the manufacturer the proper method of installation and connection of the equipment that is to be furnished and installed. Obtain all information that is necessary to facilitate the work and to complete the project.

1.5 COOPERATION AND COORDINATION WITH OTHER TRADES

A. It shall be the responsibility of the Plumbing Subcontractor to fully coordinate his work with that of the other trades so that all work may be installed in the most direct and workmanlike manner and so that interference between piping, ducts, conduits, equipment, architectural and structural features and other work will be avoided.

B. This Subcontractor shall obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. He shall also obtain all information from the General Contractor which may be necessary to facilitate his work and the completion of the whole project.

C. It shall be the responsibility of the Plumbing Subcontractor to consult with and provide the General Contractor with the exact location and size of all openings, and full information of the required work at the proper time and it will be the duty of the General Contractor to provide the same.

D. The Plumbing Subcontractor shall be responsible for the proper location of his required sleeves, chases, inserts, etc., and see that they are set or cut into the concrete.

E. In case the work of the two trades interferes in such a manner as to necessitate a deviation from the design, this work shall not proceed in this area until the Designer has been notified and has rendered a decision as to the manner in which the difficulty shall be overcome.

1.6 RECORD DRAWINGS

A. Refer to Section 01700 - CONTRACT CLOSE-OUT

1.7 PERMITS, FEES, RULES AND REGULATIONS
A. Give the proper Authorities all requisite notices or information relating to the work under this Section. Obtain and pay for all fees, licenses, permits and certificates. Comply with the rules and regulations of all Local, State and Federal Authorities having jurisdiction, the Codes, Standards, recommended practices and manuals of the National Fire Protection Association and the Public Utilities Companies serving the building.

1.8 PROTECTION OF WORK AND PROPERTY

A. Be responsible for the care and protection of all work included under this Section until it has been tested and accepted.

B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment at no cost to the Owner.

C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen and make good any damage thus caused.

1.9 SUBMITTAL REQUIREMENTS

A. Refer to Section 01300 - SUBMITTALS

B. Submit the following shop drawings for approval:

1. Plumbing fixtures, trim, faucets and accessories
2. Valves, hangers, supports
3. Cleanouts and access doors
4. Pipe Insulation
5. Pipe identification,
6. reduced pressure backflow preventer (If required)
7. Pipes,
8. Wall hydrants
9. Water meters
1.10 MATERIAL AND EQUIPMENT STANDARDS

A. Where materials or equipment are specified by patent proprietary name, or name of the manufacturer, such Specification shall be deemed to be used for the purpose of establishing a standard for that particular item. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified and only if the term "equal" appears.

1.11 GUARANTEE

A. Refer to Section 01700 - CONTRACT CLOSE-OUT

1.12 CERTIFICATES OF APPROVAL

A. Refer to Section 01700 - CONTRACT CLOSE-OUT

B. Furnish any certificates necessary as evidence that the work conforms to the requirements of all authorities having jurisdiction.

1.13 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. Refer to Section 01700 - CONTRACT CLOSE-OUT

B. Each manual shall contain the following information:

1. Description of each system, with description of each major component of the system.

2. Complete sets of page-size fixture and equipment show drawings including any control drawings.

3. A lubricating schedule of all specified equipment.

4. Exploded views of equipment showing names of parts and parts numbers.

5. Fixture and equipment identification list with serial numbers.


7. Final water balancing report of fixtures and equipment.

8. Water treatment procedure and tests.

9. Names, addresses and phone numbers of all suppliers and service personnel for all equipment.

10. Copies of all product equipment and system guarantees from manufacturers, including signed written guarantee of system from this Subcontractor.

1.14 CLEANING AND ADJUSTING
A. At the completion of the work, all fixtures, equipment, apparatus and exposed trim included in this Section, shall be cleaned and left ready for use. Equipment or fixtures which have been damaged during construction shall be replaced with new at no cost to the Owner.

1.15 DEBRIS

A. The Plumbing Subcontractor shall be responsible for the removal of all debris caused by his work and his workmen. Such debris shall be removed daily in order to leave all areas in a clean and safe condition.

1.16 TEMPORARY WATER

A. Refer to Section 01500 - TEMPORARY FACILITIES.

1.17 WATERPROOFING AND COUNTERFLASHING

A. The Plumbing Subcontractor shall provide all counterflashing for all piping as applicable and as provided by him, which pierce roofs, walls and other weatherbarrier surfaces.

B. Pipes passing through slabs shall have the sleeve extended above floors as hereinafter specified to retain any water and the space between the pipe and sleeve caulked with lead wool. The top shall be sealed with lead and the bottom shall be sealed with monolastic caulking compound.

1.18 CONNECTIONS TO EQUIPMENT

A. The Plumbing Subcontractor shall provide all pipe connections, as applicable, to equipment provided under other Sections of the Specifications as shown on the contract drawings and herein specified including final connections to equipment to result in a complete system, fully operational. Coordinate location of all equipment with the General Contractor and Designer. Obtain installation diagrams and methods of installation of all equipment, from manufacturers. Follow instructions strictly. If additional information is required, obtain same from the Designer.

1.19 STANDARD OF MATERIALS AND WORKMANSHIP

A. Refer to Division 1 for general instructions and, in addition, adhere to the following:

1. Workmanship and installation methods shall conform to the best standard practice. Work shall be performed by skilled tradesmen under the direct supervision of fully qualified personnel.

2. Install equipment in strict accordance with manufacturer’s written recommendations.

3. When requested, submit samples of materials proposed for review before proceeding with the work.

4. Install equipment and materials to present a neat appearance. Run piping parallel with or perpendicular to building planes.
5. Conceal piping in finished areas. Install work so as to require a minimum amount of furring.

6. Make provisions for neat insulation finish around equipment and materials. Do not mount piping or equipment within insulation depth.

7. Equipment, materials and work shall comply with the requirements of generally recognized agencies, and shall conform to and be installed in strict accordance with Federal, state and City or Town requirements and shall meet all of the requirements of all authorities having jurisdiction.

1.20 ABBREVIATIONS AND DEFINITIONS

A. “This Subcontractor”, “The Contractor” and “P.C.” mean specifically the Plumbing Subcontractor working under this respective of the Specifications.

B. “Equipment” as mentioned and intended herein shall mean any and all plumbing fixtures and equipment.

C. The terms “storm drainage” and “rainwater drainage” are synonymous and are used interchangeably.

D. “Provide” may be used in place of “furnish and install” and where used shall mean to deliver, furnish, erect, and connect up complete in readiness for regular operation, the particular work and equipment referred to, unless otherwise specified.

E. “Concealed” shall be defined as areas where piping is located in chases, shafts, and furred ceilings.

F. All other piping shall be considered “exposed”.

G. “Exposed” shall mean within sight in closets, in finished rooms, under counters, behind and/or under equipment and/or otherwise visible.

H. “Underground” shall mean pipe, conduit or equipment that is buried exterior to or within the building.

I. “Finish grade” as used herein means the final grade elevations indicated on the Drawings.

J. “Piping” shall mean and include pipe, fittings, hangers and valves.

K. “Tempered water” shall be considered the same as hot water throughout the Specification.

L. “Date of acceptance”, as it is used in reference to the guarantee, shall mean that date upon which the system or equipment is turned over and accepted by the Owner complete with initial start-up and the Owner’s instruction period.

1.21 DRAWINGS
A. The Drawings are intended to show approximate locations of apparatus, fixtures and piping in diagrammatic form. The Drawings are not intended to show Architectural and Structural details.

B. Do not scale drawings. Obtain any information requiring accurate dimensions from Architectural and Structural Drawings and from site measurements. Check locations and elevations before proceeding with work.

C. At no additional cost to the Owner, make all changes and additions to provide materials and/or equipment necessary to accommodate structural and architectural conditions.

D. Leave areas clean where space is indicated as reserved for future equipment.

E. Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils, and tubes.

F. Where “roughing-in” only for equipment, which is not part of this Section, obtain accurate information before proceeding with the work.

G. Provide all ceiling mounted components, including access doors and panels, in strict accordance with reflected ceiling plans.

H. Refer to Architectural Drawings for fire ratings of walls and slabs. The intent is this Subcontractor shall be fully responsible for sealing all penetrations to maintain the required fire ratings.

1.22 CROSS AND INTERCONNECTIONS.

A. No plumbing fixtures, equipment, connection, device or pipe shall be installed which would provide a cross or interconnection between a distributing supply and a drainage system or a soil or waste pipe, which would permit or make possible the backflow of sewage, polluted water, pollutants or waste into the domestic water supply system, unless such connections are protected with approved cross connection devices.
PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Type A:

Type K soft annealed copper tubing one piece with no joints as manufactured by Bridgeport Brass, American Brass, Revere Copper or equal between the connection to the exterior water supply and the first fitting within the building. Fittings shall be wrought copper joined with a silver brazing filler.

B. Type B:

Type M hard drawn copper tubing with wrought copper sweat fittings as manufactured by Bridgeport Brass, American Brass, Revere Copper or equal joined with 95/5 lead free tin antimony solder.

C. Type C:

Type L hard drawn copper tubing with wrought copper sweat fittings joined as manufactured by Bridgeport Brass, American Brass, Revere Copper or equal with approved 95/5 lead free tin antimony solder. PEX, FLOW-GUARD or Approved equal may be substituted in lieu of copper piping.

D. Type D:

No hub cast iron soil pipe and fittings joined with approved stainless steel mechanical couplings 4-band for up to 4” diameter, 6-band for over 4”. Sealing gasket shall be Neoprene in accordance with ASTM-C564. Polyvinyle Chloride (PVC) piping may be substituted in lieu of cast iron

E. Type E:

Service weight bell and spigot cast iron soil pipe and fittings joined with neoprene resilient gaskets. Polyvinyle Chloride (PVC) piping may be substituted in lieu of cast iron

F. Type F:

Service weight bell and spigot cast iron soil pipe and fittings joined with oil free Okum and lead. Polyvinyle Chloride (PVC) piping may be substituted in lieu of cast iron

G. Type G:

Type DWV hard drawn seamless copper tubing with wrought copper drainage fittings joined with 95/5 lead free tin antimony solder. Polyvinyle Chloride (PVC) piping may be substituted in lieu of cast iron

H. Pipe and fittings shall be in accordance with the following:

1. Exterior Water Service Type A

PLUMBING
22 0000 - 11
2. Cold Water
3. Hot Water Supply
4. Sanitary Waste and Vent Buried
5. Sanitary Waste and Vent within the building
6. Waste and Vent within the building Smaller than 2 inches
7. Waste and Sanitary from last building clean out to 10’ beyond foundation wall
8. Water heater relief valve discharge piping
9. Gas Piping
10. Non-Potable Cold Water

2.2 INSULATION

A. Pipe insulation shall be similar to Owens Corning, John Manville, Certain-teed, Armstrong or equal.

1. Type A: Owens Corning Fiberglass ASJ/SSL-II heavy density resin-bonded inorganic glass, all service gasket, Kraft reinforced fill vapor retarder jacket with two factory-applied pressure sensitive adhesives for positive closure and vapor sealing. Turn all laps away from normal view. Circumferential joints shall be sealed with self-sealing butt strips. Valves and fittings shall be insulated with Zeston Hi-Lo temperature insulation of thickness equal to adjacent piping and covered with Zeston 2000 PVC fitting covers, 25/50 rated with approved vapor retarder mastic compatible with the PVC applied around the edges of the adjoining pipe insulation and on the fitting cover throat overlap seam. Secure with pressure sensitive PVC; Z tape along the circumferential edges. Extend tape over adjacent insulation with overlap on itself of at least 2 inches.

2. Type B: Owens Corning fiberglass ASJ heavy duty resin bonded inorganic glass, all service jacket with longitudinal laps sealed with staples. Turn all laps away from normal view. Circumferential joints shall be sealed with self-sealing butt strips. Valves and fittings shall be insulated with Zeston Hi-Lo temperature insulation of thickness equal to adjacent piping and covered with Zeston 2000 PVC fitting covers, 25/50 rated, secured in place with tacking and finished with pressure sensitive PVC Z tape along the circumferential edges. Extend tape over adjacent insulation with overlap on itself of at least 2 inches. All tacks and staples shall be finished with white finish.

3. Type C: Truebro-Handi Lav-Guard, Handy Shield, Brocar-wrap it right or equal.

4. Insulation shall be in accordance with the following schedule:

<table>
<thead>
<tr>
<th>Service</th>
<th>Insulation Thickness</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cold Water, non-potable cold water</td>
<td>1/2”</td>
<td>A</td>
</tr>
<tr>
<td>Hot Water Supply</td>
<td>1”</td>
<td>B</td>
</tr>
<tr>
<td>Hot Water and Waste beneath handicapped lavatories</td>
<td>1/2”</td>
<td>C</td>
</tr>
</tbody>
</table>
2.3 PIPE SLEEVES, HANGERS AND FIXTURE SUPPORTS

A. Pipe sleeves, pipe hangers, pipe anchors, auxiliary steel, wood blocking and fixture supports shall be furnished and set by this Subcontractor, and he shall be responsible for their proper and permanent location. This Subcontractor shall be responsible for all core drilling.

B. Pipe sleeves shall be installed and properly secured at all points where pipes pass through concrete or wood. Pipe sleeves shall be of sufficient diameter to provide approximately 1/4 inch clearance around insulation. Pipe sleeves through partitions and floors shall be Schedule 40 galvanized pipe. Wall sleeves shall have chromium-plated escutcheons with set screws or clips for firmly holding in place. Sleeves in floor shall extend one inch above the floor and after installation of piping shall be packed and made watertight. Core openings shall have Link-Seal fire rated penetration closures. Sleeves in exterior walls shall have water stop plates, shall end flush with the surface of the walls and shall have Link-Seal penetration closures.

C. Where pipes penetrate fire rated floors and partitions, the openings shall be packed with a material which will maintain the integrity of the fire rating. Refer to Section 07250.

D. All piping shall be rigidly supported from the building structure by means of approved hangers and supports. This Subcontractor shall furnish and install all required auxiliary steel required for hanging of piping.

E. All horizontal piping shall be hung with approved adjustable malleable iron pipe hangers. Cast iron soil pipe shall be supported at five-foot intervals except where ten-foot lengths of piping are used, then ten-foot intervals are acceptable. Copper tubing 1 1/2 inch and larger shall be supported at ten-foot intervals. Copper tubing 1 1/4 inch and smaller shall be supported at six foot intervals.

F. Vertical cast iron piping shall be supported at base, at each story height and at ten-foot intervals. Vertical copper tubing shall be supported at each story height and at not more than ten-foot intervals.

G. Hangers for piping sizes four inches and smaller shall be Carpenter-Patterson, No. 1A band type, Grinnell Company, Calco Steel Products Company or equal, black steel with hanger rods with machine threads; for un-insulated copper tubing, the hangers shall be copper plated. Hangers for piping larger than four inches shall be the adjustable clevis hanger type, malleable iron with extension rod. Chain, strap, perforated bar or wire hangers will not be approved. Approved gang hangers may be used in lieu of separated hangers on pipes running parallel to each other and close together. Where used for un-insulated copper tubing, all hangers shall be copper plated. This Subcontractor shall furnish and install the steel insulation shields at each hanger location on piping to be insulated. Structure attachments shall be as manufactured by Carpenter-Patterson and shall be suitable to carry the weight. Pipe alignment guides shall be split-sleeve type as manufactured by Broat Manufacturing, Inc. and suitable for copper tubing.

H. All fixtures and equipment shall be supported and fastened in a satisfactory manner and in accordance with fixture manufacturer's recommendations.
I. Where chair carriers are required, they shall be completely concealed in the building construction and shall rigidly support the fixture from the floor. Chair carriers shall be adjustable both vertically and horizontally and shall support fixtures in such a manner that no part of the fixtures shall be supported by the wall or partition. Chair carriers shall be furnished complete with necessary bolts, nuts and washers as well as connecting nipples of the proper length with gaskets for the fixture connection. Any movement of fixtures is unacceptable. Chair carriers for water closets and urinals shall include flushometer supply pipe support. Chair carriers shall be as manufactured by Josam, J.R. Smith, Zurn or equal.

J. Wherever wood blocking is required to insure adequate support of fixtures and related piping, it shall be provided by this Subcontractor.

K. Whenever new penetrations to a previously poured slab are required for the installation of floor drains, shower drains, mop receptors, flush floor cleanouts or similar items of plumbing, these penetrations shall be totally sealed with a fire and water stop sealant. Sealant shall be Dow Corning fire stop sealant, Catalog No. 2000, 3M, GE Silicones, or equal. Hourly fire rating in hours must meet the requirements of the slab being penetrated.

2.4 CLEANOUTS

A. Cleanouts shall be as manufactured by Josam Manufacturing Company, J.R. Smith Manufacturing Company, Zurn Industries, Incorporated or equal.

B. Cleanouts shall be iron body with heavy brass plug and raised nut, same size as pipe for piping up to four inches for piping larger than four inches in size and closed gas tight. Floor cleanouts in carpeted areas shall have carpet clean out markets. Floor cleanouts shall not be located beneath partitions.

C. All cleanout types shall be Josam, J.R. Smith, Zurn or equal. End cleanouts on no hub cast iron shall be Josam Series 58900-20. End cleanouts on copper waste shall be Nibco 816. Flush floor cleanouts shall be Josam Series 56000-2-22-41 in concrete floors. Exposed Dandy cleanouts on no hub cast iron shall be Josam Series 58910-20. Wall cleanouts and concealed Dandy cleanouts on no hub cast iron shall be Josam Series 58910-19 with Series 58890 clean out plug with center screw length as required.

2.5 VALVES

A. Each valve type shall be the product of a single manufacturer. Each system shall be provided with valves as required by code and as shown on the drawings. Valves shall be installed to facilitate operation, replacement and repair. Provide access panels where valves are concealed behind non-removable ceilings or walls. Provide shut off for supply piping to individual pieces of equipment. All valves to be Apollo, Jenkins, Watts or equal.

B. All shut off valves on cold water and hot water piping two inches and smaller shall be Apollo Series 77-200, solder end, bronze body ball valve, chrome plated bronze ball, 600 psi WOG full port ball valve.
C. All shut off valves on cold water and hot water piping 2 1/2 inch and 3 inch shall be Apollo Series 70-200, solder end, bronze body ball valve, chrome plated bronze ball, 600 psi WOG.

D. All check valves on cold water and hot water piping 2 1/2 inch and 3 inches and less in size shall be Jenkins figure No. 4093, solder end, bronze body swing check, bronze disc, 300 psi.

E. All drain valves shall be 1/2 inch Apollo model 78-103 with Watts No. 8A hose connection vacuum breaker, cap with chain of length as required.

F. All ball valves for installation in insulated piping shall have valve extensions to suite installation thickness.

G. Fuel Gas Cocks
   1. Gas cocks 2 1/2" and larger shall be all iron, lubricated plug, flanged ends, 125 psi working pressure:
      Crane 325, Rockwell 143 or Walworth 1797F.
   2. Gas cocks 2" and smaller shall be bronze, lubricated plug, screwed ends, 125 psi working pressure:
      Crane 254, Hays 7005 pr. Meuller H-11003.
   3. Provide one wrench for each gas cock size.

H. Vacuum breakers shall be bronze 200 PSIG, 250°F, 1/2" male threaded. Watts No. 36A, Febco, Amtrol or equal.

I. Thermometers for hot water piping shall be dial type, 5" dial size, 1/2" union connection, stainless steel case and stainless steel thermometer well, range 0-200°F. Ashcroft NU 50-6042 EHT with 3956 well, Amtrol, Zurn or equal.

2.6 FLOOR DRAINS
   A. Not Applicable

2.7 WALL HYDRANTS
   A. Wall hydrants shall be Josam, Chicago, Zurn or equal.
   B. Josam Model No. 71050-72-73 series cast bronze non-freeze wall hydrant with satin finish nikaloy face, 3/4 inch HPT outlet, integral vacuum breaker back-flow preventer, pressure relief valve, bronze casing, bronze operating parts convertible into service tool, 3/4 inlet connection.

2.8 CIRCULATING PUMP
   A. Not Applicable
2.9 PLUMBING FIXTURES

A. Plumbing fixtures shall be approved by building owner before submission to engineer for approval. Refer to fixture list on drawing for standard of fixtures required.

2.10 ANCHORS, EXPANSION JOINTS AND OFFSETS

A. Make proper provisions for expansion and contraction in all parts of the hot water piping systems wherever possible by means of pipe bends, pipe offsets, swing connection or changes in direction of piping.

2.11 WATER METER

A. Furnish and install a domestic displacement type water meter at the location shown on the drawings and in accordance with the following:

1. Meter shall be approved by local Water and Sewer department.
2. The Plumber shall pay for all fees required by local authorities.
3. Shut-off valves shall be installed on both sides of the meter and strainers shall be installed on the inlet side of the meters after the inlet shut-off valves.

2.12 PIPE IDENTIFICATION

A. All piping, except that piping which is within inaccessible chases, shall be identified with semi-rigid plastic identification markers equal to Setmark Pipe Markers. The Sani-Tech Group, Seton Name Plate Co. or equal. Direction of flow arrows are to be included on each marker. Each marker background shall be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1-1981). Setmark Type SNA markers shall be used above five inch overall diameters. Markers shall be located adjacent to each valve, at each branch, at each cap for future, at each riser take off, at each pipe passage through wall, at each pipe passage through floors, at each pipe passage to underground and on all vertical and horizontal piping at 20 foot intervals maximum. All non-potable water lines and outlets shall be identified in accordance with the requirements of the Massachusetts Uniform State Plumbing Code.

B. All valves shall be designated by distinguishing numbers and letters carefully coordinated with a valve chart. Valve tags shall be 19 gauge polished brass, 1 1/2 inch diameter with stamped black filled letters, similar to Seton S type 250-BL or equal. Lettering shall be 1/4 inch high for type service and 1/2 inch for valve number. Tag shall be attached to valves with approved meter seals with four ply .018 copper smooth wire or approved brass "S" hooks, or brass jack chain. Whenever a valve is above a hung ceiling, the valve tag shall be located immediately above the hung ceiling.
C. Furnish a minimum of two typed valve lists to be framed under glass or Plexiglas. Each chart shall be enclosed in an approved .015 inch thick plastic closure for permanent protection. Valve numbers shall correspond to those indicated on the Record Drawings and on the printed valve lists. The printed list shall include the valve number, location and purpose of each valve. It shall state other necessary information such as the required opening or closing of another valve when one valve is to be opened or closed. Printed frame valve lists shall be displayed in each Mechanical Room or in a location designated by the Owner.

D. Equipment nameplates shall be 3/4 inch by 2 1/2 inch long .02 inch aluminum with a black enamel background with engraved natural aluminum letters similar to Seton Style 2065-20. Nameplate shall have pressure sensitive taped backing.

2.13 TESTS AND APPROVALS

A. Pipe lines shall be blown or flushed clean, before piping tests are applied. All plumbing work shall be tested as herein specified. No portion shall be covered, concealed, used or made inaccessible to testing, inspection, repair, correction or replacement until tests thereof have been satisfactorily completed in the presence of the Designer's Authorized Representatives. The Plumbing Subcontractor must accommodate his testing operations to the progress of the project as a whole. Correct all defects appearing under test and repeat until all parts of the work have withstood them successfully.

B. Furnish all labor, material and services for testing, including testing plugs, pumps and compressors; he shall make and remove all temporary piping connections required for the tests and shall dispose of test water and all wastes after tests. Leave all work in good order, ready for full use.

C. Tests on all plumbing systems shall be made in accordance with the requirements of the Local Plumbing Code.

2.14 WATER HAMMER ARRESTORS

A. Not Applicable

2.15 REDUCED PRESSURE BACKFLOW PREVENTER

A. Reduced pressure backflow preventers shall be as manufactured by Watts, Hersey/Beeco, Febco, or an equal, listed and accepted by the Massachusetts Department of Environmental Protection.

B. Type shall be:

1. Watts, Conbraco or approved equal

2.16 NATURAL GAS PIPING SYSTEM

A. Gas piping shall be Schedule 40 black steel pipe with threaded ends and 150 pound black malleable iron flat band threaded fittings.
B. The gas distribution system installation shall include all pipe, fittings, valves and all accessories and incidentals to conform with the code requirements. Piping shall be installed with an 8" long sediment leg at the base of all drops and shall be arranged with drain valves at low points. All changes in directions shall be made with plugged tees for cleaning piping out.

C. The Plumbing Subcontractor shall make all final connections between each piece of equipment requiring gas and the gas distribution systems.

D. The Plumbing Subcontractor shall obtain all permits for the installation of the interior gas distribution systems. Supplying Gas Company back charges and fees shall be paid by the Plumbing Subcontractor.

E. Approved “Flex” piping may be substituted in lieu of black steel and if approved by local plumbing inspector

2.17 CLEANOUTS

A. Floor cleanouts shall have cast iron body and frame, extra heavy duty round adjustable scoriated nickel bronze top, taper thread bronze plug and inside caulk outlet. Smith 4108, Josam, Zurn or equal.

B. Cleanouts for installation in exposed horizontal or vertical drainage lines shall have threaded, rough brass, raised head plugs.

C. Wall cleanouts shall have cast iron caulk ferrule with cast brass taper thread counter-sunk plug and round stainless steel secured cover. Smith 4422, Josam, Zurn or equal.

2.18 THERMOSTATIC MIXING VALVE

A. If required for domestic hot water from boiler/water heater

2.19 ELECTRICAL MOTOR CHARACTERISTICS

A. Not Applicable

2.20 STARTERS AND CONTROLLERS

A. Not Applicable

2.21 ACCESS PANELS

A. Refer to Section 08305 – ACCESS DOORS.

B. Furnish access panels for access to all concealed parts of the plumbing system that require accessibility for the proper operation and maintenance of the system.

C. Refer to the Contract Architectural Reflected Ceiling Drawings for plaster ceiling locations where the above panels are applicable.
D. Point out to the Ceiling Subcontractor exactly which tile units are to be marked with a colored button to indicate equipment above.

E. All access panels shall be lockable type and refer to Section 08305 for details.

2.22 STORAGE TANKS

A. Not Applicable

2.23 Water Heater

A. Provided and installed by HVAC contractor. Plumber responsible for plumbing piping and accessories

2.24 GAS AND SAND TRAP

A. Not Applicable

2.25 ROOF DRAINS

A. Not Applicable

2.26 CONCRETE CHAMBERS

A. Not Applicable
PART 3 - EXECUTION

3.1 GENERAL

A. Provide materials and equipment as shown and specified or as required to provide complete and satisfactory operating systems, omitting only those items specifically excluded. Make connections to equipment, devices, etc., provided or installed under this Section as shown and specified.

B. All equipment, fixtures, outlets and devices shown in the Plumbing and Architectural Drawings shall be connected with all of the proper utilities and properly tied into the building plumbing systems.

3.2 MATERIALS AND WORKMANSHIP

A. Work shall be executed in a workmanlike manner and shall present neat and mechanical appearance when completed. Piping shall run concealed except in mechanical rooms and areas where no ceiling exists.

B. Work and workmen shall be fully insured as required.

C. Material and equipment shall be furnished new.

D. The Owner shall not be responsible for material and equipment prior to testing and acceptance.

3.3 BULLETINS, MANUALS AND INSTRUCTIONS

A. Furnish operation, lubrication and maintenance manuals for each piece of equipment.

3.4 INSTALLATION OF EQUIPMENT

A. Equipment shall be installed to avoid interference with structure and with work of other trades.

B. Equipment shall be installed so as to properly distribute equipment loads.

C. All steel supports and hardware for proper installation of anchors, guides and hangers shall be provided.

3.5 EXPANSION

A. All piping shall be installed to allow for expansion using offsets, loops or expansion joints.

B. Provide alignment guides and anchors as required.

C. Install piping to allow freedom of movement in all planes without imposing undue stress on any section of the main piping, branch piping, equipment and structure.
D. Install expansion joints in accordance with manufacturer’s published installation instructions.

3.6 PIPE GUIDES AND ANCHORS

A. Provide pipe guides for expansion joints according to expansion joint manufacturer’s published recommendations. Use at least two guides each side of expansion joint or loops.

B. Install manufacturer or field fabricated alignment guides to allow movement in axial direction only. Install vertical risers properly anchored and guided to maintain accurate vertical position of piping. At time of start-up, clean and lubricate guides and adjust to allow free sliding at operating conditions.

C. Fabricate anchors from structural steel channels, plates or angles secured to the structure.

D. Take care to avoid introduction of excessive reactive forces and operating weights into the structure and onto equipment and piping.

E. Prepare and submit for review, prior to installation, drawings showing the location of expansion joints and anchors. Show details of proposed connection to structure.

3.7 INSERTS

A. Properly locate and firmly secure inserts to form before concrete is poured, for new construction.

B. For support of light equipment and materials, approved self-drilling expansion shields may be used.

C. Where inserts must be placed after concrete has been poured, use self-drilling expansion shield inserts as approved by the Structural Engineer.

D. Place inserts only within main structure and not in any finishing materials.

E. When inserts are required in precast concrete, supply inserts and location drawings to the precast concrete supplier for casting into the material. Otherwise, include the cost of having the precast concrete supplier install inserts at the site.

F. Use wedge type concrete inserts, similar to Grinnell Fig. 281, for pipe and equipment hangers, supports and anchors, adequately sized for loads to be carried. Fee and Mason, Patterson and Carpenter or equal.

G. The use of “explosive” type inserts shall be prohibited.

3.8 HANGERS

A. Suspend piping and equipment with all necessary hangers and supports required for a safe and workmanlike installation. Ensure that pipes are free to expand and contract and are graded properly and that each hanger is adjusted to take its full share of the weight.
B. Suspend hanger rods directly from the structure. Do not suspend from pipes, ducts, equipment, metal work, ceilings or hangers of other trades.

C. Supply and install auxiliary structural steel angles, channels and beams where piping and equipment must be suspended between joists or beams.

D. Hangers shall be spaced to ensure that structural steel members are not overstressed. In no case shall pipe hangers be further apart than indicated in this Specification.

E. The use of trapeze-type hangers for support of piping shall be subject to prior acceptance. Where permitted, fabricate from angle or channel frames and space hangers to suit the smallest pipe size.

F. Do not use hooks, chains or straps to support equipment and materials.

G. All hangers shall be suspended directly from slabs, beams and the top chord of joists. Hangers shall not be suspended from the bottom chord of joists.

H. Copper piping shall utilize copper plated supports or copper plated rockers sized for insulation thickness to hanger ring on underside [to prevent electrolysis].

3.9 PIPE IDENTIFICATION

A. Provide color-coded pipe identification markers on all piping installed under this Section.

B. Pipe markers shall be snap-on laminated plastic equal to “Setmark” by Seton Name Plate Corp. Star Sprinkler Corp., W.H. Brady or equal.

C. Provide an arrow marker with each pipe service marker.

D. Piping shall be labeled at twenty feet intervals and at the entrance and exit of all mechanical areas.

E. In general, one and one-half inch high legend shall be used for pipes four inch diameter and larger; 3/4 inch high legend shall be used for pipe lines three inch diameter and smaller.

F. Color coding shall be in accordance with industry standards and with ANSI A13.1, latest edition.
G. Locate identification and flow arrows as follows:

1. On vertical pipes approximately seven feet above floor.

2. Behind each access door and panel.

3. At each change of direction of piping.

4. On each piping branch closest to point of connection to main piping.

5. At all valves.

6. At intervals not greater than 40 feet on straight runs of exposed piping and on both sides of walls.

H. Identify all pumps, controls, remote switches, starters, disconnects, push-buttons and similar equipment as to service with white lamacoid engraved nameplates with black letters. Firmly secure with self-tapping screws. Submit sample plates and lettering for review.

I. Provide typewritten master lists in Operating and Maintenance Instruction Manuals; and shop equipment numbers on Record Prints and Sepias.

3.10 VALVE TAGS AND CHART

A. At the completion of work, attach to each valve on the hot and cold water system, a valve tag of at least 1 1/2 inch in diameter with designating numbers corresponding to a chart for identification purposes.

3.11 ACCESS AND ACCESS PANELS

A. Provide proper access to all valves, traps, strainers, controls and material and equipment which may need inspection, replacement or service. Coordinate locations with the General Contractor.

B. Where shut-off valves or other items requiring access occur, furnish access panels for installation under other sections.

3.12 ESCUTCHEONS

A. Escutcheons shall be installed around exposed pipe passing through finished floors, walls and ceilings. Escutcheons shall be heavy, cast brass, chromium plated and adjustable to fit snugly around pipe, with set screw.

3.13 SLEEVES

A. Provide sleeves for all services except soil, waste, vent and rainwater.

B. Set sleeves for piping in conjunction with erection of floors and walls, for new construction. Locate sleeves accurately and in accordance with Shop Drawings.
C. Size sleeves to provide one inch clearance around piping and to allow continuous runs of insulation where specified. Ensure that piping does not touch sleeves.

D. Piping sleeves shall be according to the following:

1. Through interior walls, use 18 gauge rolled and tack welded galvanized steel sleeves, set flush with finished surfaces on both sides. Refer to Room Finish Schedule.

2. Through exterior walls above grade and roofs, use machine cut and reamed standard weight steel piping, set flush with finished surfaces on inside and to suite flashing on outside.

3. For floors in mechanical equipment rooms, and similar areas where a water dam is required, use machine cut and reamed standard weight steel piping set flush to underside of structure and extending two inches above finished floor.

4. For other floors, use 18 gauge rolled and tack welded galvanized steel, or machine cut and reamed plastic pipe or standard weight steel piping set flush to both finished surfaces. Refer to Architectural Room Finish Schedule. Exception: In areas with a sprinkler system, sleeves shall extend one and one-half inches above floor.

5. Refer to drawing details for sleeving through below grade walls.

6. Cover pipe sleeves in walls and ceilings of finished areas other than equipment rooms with satin finish stainless steel, or satin finish chrome or nickel plated brass escutcheons, with non-ferrous set screws. Do not use stamped steel split plates. Split cast plates with screw locks may be used.

E. Prepare and submit detailed drawings showing accurate size and spacing of sleeves. Submit for review at least four weeks before installation.

3.14 FLASHING

A. Roof and floor penetrations

3.15 INTERIOR WATER DISTRIBUTION

A. Furnish and install a properly sized compound water meter and all valving and accessories at as approved by the Boston Water and Sewer Commission. Provide meter support, inlet and outlet shut-off valves, inlet strainer and system drain valve. Provide individual water meters to retail tenant space and as noted on the drawings.

B. All interior water piping shall be run parallel with the lines of the building unless otherwise shown or noted on the Drawings and shall be concealed or run in the least conspicuous locations.

C. All interior service pipes, valves and fittings shall be kept a sufficient distance from other work to permit finish covering not less than 1/2 inch from such other work.
D. Furnish and install valves or stops on each connection to fixtures. Hot and cold water branches shall be valved with access panels provided as required.

E. Complete provisions shall be made for expansion, contraction and draining of all supply piping. Install drain valves with chains and caps at all low points.

F. All lines of water piping shall be protected from water hammer with approved shock absorbers at the ends of all branches and risers. Shock absorbers shall be used for all flush and quick closing valves. Shock absorbers or air chambers shall be used at all other fixtures and fixture groups which do not have a quick-closing valve. Shock absorbers shall be installed in accordance with the Copper Development Association guidelines.

G. Hot water pipe take offs shall have a minimum of three elbow swing.

H. Mechanical make-up water shall be provided with a reduced pressure backflow preventer and capped for extension.

3.16 INTERIOR SANITARY, WASTE AND VENT PIPING

A. Sanitary, waste and vent piping shall be installed as shown on the Drawings.

B. Piping shall be installed without undue strains and stresses, allowing for expansion and contraction.

C. A three inch air gap shall be provided on all equipment and drains discharging to floor drains.

D. Sanitary, waste piping four inches and larger shall run at a uniform grade of 1/8 inch per foot. Pipe sizes three inches and smaller shall run at 1/4 inch per foot.

E. Horizontal vent piping shall be graded and connected so as to drain back to the sanitary or waste pipe by gravity at a slope of not less than 1/8 inch per foot for pipes 3 inches and larger. Minimum slope for vent pipes less than 3 inches shall be 1/4 inch per foot.

F. Piping shall be tested and approved prior to backfilling or concealing.

G. All open pipe ends, including grates of all drains, shall be temporarily sealed during construction to prevent the entrance of foreign debris.

H. Buried piping shall be a minimum of three inch size and be uniformly supported along its entire length. The minimum vent through the roof size shall be three inch.

I. The locations shown for buried sanitary are approximate only. Run the lines such that they are not installed within the “zone of influence” of the footings and below grade structures. In general, this means not below a 45 degree plane down and away from the lower edges of the footings.

J. The Plumbing Subcontractor shall be responsible for the quality of all excavation, trenching and backfill and for monitoring that work sufficiently to ensure a quality installation.
K. Piping through the building wall and at the building cleanout shall be caulked with lead and oakum. Offsets [caulked] in the sewer lines shall be provided in order to install the building cleanout in a direct line with the leaving sewer, in accordance with the code.

L. All connections to combined sewers shall be trapped and separately vented to atmosphere.

M. All in-slab and underground work must be complete and tested prior to scheduled slab work. Any such work omitted or found defective after pouring of slabs will be the responsibility of this Subcontractor to correct, including but not limited to plumbing, excavation, backfill, compaction and concrete. This Subcontractor is responsible for the inspection of underground piping installed under this Sub-Contract and proper coordination of inspecting agencies and concrete schedule.

3.17 WATER SERVICE ENTRANCE

A. The exterior water piping shall begin at the points indicted outside the building wall and run as indicated on the Drawings.

B. Excavation for underground water piping shall be kept open until system is tested and approved.

3.18 EXTERIOR SANITARY SEWER

A. The sanitary sewer shall run by gravity and extend to the points indicated outside the exterior building wall.

B. Piping shall be tested and approved prior to backfilling.

C. Provide a proper building cleanout for each service, just prior to the exit point, with proper access.

3.19 GAS SYSTEM

A. Provide a complete natural gas system beginning from the discharge of the supplying Gas Company’s meter. Initiate the Owner’s request for Service with the Gas company and coordinate the installation and timing of their work.

B. All horizontal lines shall be graded not less than one-fourth [1/4] inch in fifteen [15] feet to drip pockets, which shall be readily accessible to permit cleaning and emptying. A suitable drip or condensation pocket shall be installed at service entrance, bottom of risers, and where required where condensate may collect. Furnish access panels for hidden drips.

C. Each outlet, including a valve or cock outlet, shall be securely closed gas-tight with a threaded iron plug or cap immediately after installation and shall be left closed until this equipment or appliance is connected thereto.

D. All branch outlet pipes shall be taken from the top or sides of horizontal mains and not from the bottom.
E. Every regulator and gas device requiring venting shall be vented to the outside. Low and high pressure vents shall be kept separate.

3.20 PIPE JOINTS

A. All welding for gas piping shall be done in accordance with the welding procedures of the National Certified Pipe Welding Bureau, only by certified welders with certification provided prior to the start of work. Long radius welding fittings shall be installed on all welded lines. Branches from main piping shall utilize welding tees where branch size is main size or two [2] nominal sizes smaller except, where main is two and one-half [2 1/2] inches or larger and branch size is two [2] inches or smaller utilize Thread-o-lets. Weld-o-lets shall be utilized where branch size is three [3] sizes larger than branch. Mitering of pipe to form elbows, tees, or similar construction will not be permitted. All pipe to be welded shall be cut off clean in pipe machine and beveled.

B. All screwed pipe joints shall have I.P.S. threads, and shall be made up with red lead and graphite ground in linseed oil applied to male threads only. All thread on pipe shall be full and cleaned out. Gas piping shall be made up with compound suitable for gas, similar to Rectorseal.

C. Joints for buried hub-and-spigot cast iron soil pipe that are not gasketed shall be packed with picked oakum and caulked with molten pig lead. Twelve [12] ounces of fine soft lead shall be used for each joint for each inch in diameter of the pipe. Above-grade shall be made up with Anaheim Foundry Co. “Huskey” Series 4000 couplings. “Clamp All”, “MG Coupling” or equal.

D. Joints between cast iron and steel pipe shall be made up by screwing a half [1/2] coupling on the latter to form spigot head, then make a caulked joint as specified for cast iron pipe. Joints between copper and cast iron or steel shall be accomplished with suitable adapters.

E. Soldered joints on water and waste piping shall be made up using lead free tin antimony and silver solder, conforming to Federal Spec. QQ-S-571c, and joint shall be filled the full length of the socket. The flux shall be applied evenly and tubing centered in socket of fitting. The fitting shall be heated evenly to the proper temperature to run the solder. The ends of the tubing and the inside of the fitting shall be thoroughly cleaned to a bright shining finish before applying flux. Flux shall be non-corrosive type conforming to Federal Spec. O-F-506.

F. Flanged water pipe joints shall be made with compressed rubber gaskets, full face for flanges, minimum thickness one-sixteenth [1/16] inch.

G. The Plumbing Subcontractor, if directed by the Designer is to cut joints as directed to demonstrate how joint is filled.

3.21 PLUMBING SYSTEM TESTS

A. All plumbing and gas systems shall be tested by the Plumbing Subcontractor in the presence of the Designer or his representative and the Plumbing Inspector after completion of “ROUGHING IN” and before concealing any section from view. This shall include all new systems and all existing systems and portions thereof that are scheduled to remain.
B. Furnish labor, tools, and all materials and do all testing as described herein.

C. No piping shall be insulated until it has been pressure tested and proven tight. All new systems that can be isolated with valves shall be pressure tested and proven tight as described herein.

D. Each system shall be pressure tested at pressures described herein and in a manner as described herein. Test pressures for each system shall be maintained as long as required by the Architects to determine the tightness of the system and/or as long as required to inspect the joints visually or with painted soap solutions. Wherever testing indicates leaks, the leaks shall be repaired in a manner prescribed by the Designer, and the test shall be reprocessed until the system is proven tight.

E. Soil, waste and vent piping shall have openings plugged and the system above filled with water to the top of vent pipes. Water shall be allowed to stand a minimum of sixty [60] minutes or as long thereafter as is required for the complete inspection. Each vertical stack with its branches may be tested separately. If the lines prove tight, the water shall be drawn off and the fixtures connected.

F. Water piping shall be tested to a hydrostatic pressure of one hundred fifty [150] pounds per square inch and proven tight at this pressure. Test pressures shall be held for at least eight [8] hours minimum, or as long thereafter as is required to make the complete test.

Water piping to be concealed by structural work or put below grade shall be tested to the above pressure and proven tight before pipes are concealed.

G. Furnish and make temporary installations of all pumps, compressors and instruments for the testing. Test pressures shall be held for at least the minimum time periods noted above, or long enough thereafter to prove the system shall be repaired or replaced as directed, and the expense shall be borne by the Plumbing Subcontractor. All soap tested joints shall be washed clean after testing, and test water properly drawn off.

H. All gas piping shall be tested in accordance with the Commonwealth of Massachusetts Fuel Gas Code, and the State Plumbing Inspector, and in the Inspector’s presence.

I. The Plumbing Subcontractor shall ensure that the Gas supplier tests all piping, regulators and devices that are installed by the gas supplier up through the meters and/or regulators.

3.22 CLEANING AND ADJUSTING

A. At the completion of the work, all fixtures, equipment apparatus and exposed trim for this Section shall be cleaned and, where required, polished ready for use. Faucet washers which have been damaged during construction shall be replaced. Drains and traps shall be thoroughly cleaned. At the completion of the work, all valves, faucets and automatic control devices shall be adjusted for proper and quiet operation.

3.23 DISINFECTION OF THE POTABLE WATER SYSTEM

A. The entire water distribution system shall be disinfected in accordance with one of the following methods before it is placed in operation:
1. The system, or part thereof, shall be filled with a water and chlorine solution which contains fifty [50] parts per million of available chlorine; and the same shall then be allowed to stand six [6] hours before the system, or part thereof, is flushed and returned to service. The system, or part thereof, shall be filled with a solution which contains one hundred [100] parts per million of available chlorine; and the same shall then be allowed to stand two [2] hours before the system; or part thereof, is flushed and returned to service.

2. The Plumbing Contractor shall provide a certificate of disinfection.

3.24 INSTRUCTIONS

A. After completion of assembly and installation of all systems, equipment and piping required under this Section of the Specifications, the Owner’s supervisory and operating personnel shall be instructed regarding the operation and maintenance of the systems. The instructions shall be given by the Plumbing Subcontractor and other qualified personnel who are thoroughly familiar with all systems and shall last as long as necessary and be videotaped for the Owner’s use.

B. Submit to the Owner, lists for each system and piece of equipment indicting that all components have been checked and are complete prior to instruction period.

C. Thoroughly instruct the Owner’s authorized representative in the safe operation of the systems and equipment.

D. Arrange and pay for the services of qualified manufacturers’ representatives to instruct the Owner on specialized portions of the installation.

E. Submit a complete record of instructions given to the Owner. For each instruction period, supply the following data:

1. Date
2. Duration
3. System or equipment involved
4. Names of persons giving instructions
5. Names of persons being instructed
6. Other people present

3.25 INSPECTION

A. Periodic inspections of the work in progress will be made to check general conformity of the work to the Drawings and Specifications.

B. Correct all deficiencies immediately upon notification.
3.26 CUTTING AND PATCHING

A. Refer to Section 01045 - CUTTING AND PATCHING

B. Give notification in time to other trades of openings required for Plumbing Work. Supply accurate details of location and size. When this requirement is not met, bear the cost of cutting and patching.

C. The General Contractor will do all cutting and patching required for the installation of the Plumbing Work.

D. Obtain written approval of Structural Engineer before cutting any openings through structural members.

3.27 PAINTING

A. Supply ferrous metal work, except piping, with at least one factory prime coat.

B. Finish painting will be carried out by SECTION 09900 - PAINTING.

3.28 BACKFLOW PREVENTER PERMIT AND INSTALLATION

A. All backflow prevention devices shall be approved, permitted, installed, maintained and tested in accordance with the Water Authority and all State and local requirements. A full size brass discharge line shall be extended to the nearest floor drain.

B. Prior to installation, the Contractor shall submit through the Owner, a design data sheet, with plans showing the method of protecting the water system, and secure approval from the Water Authority, or its designee. This shall not be done until the Contractor has secured the plumbing permit for the work, by the Inspector of Plumbing, and shop drawings have been reviewed.

C. Immediately upon installation, the Contractor shall have the backflow preventer tested by a “Certified Backflow Prevention Device Tester”, and the results recorded on the water authority’s forms. Within 14 days after the installation, the Contractor shall notify, through the Owner, the reviewing authority to arrange inspection of the installation. Submit copies of all paperwork to the water authority and the Engineer, through the Owner.

D. Three [3] copies of each application and all subsequent correspondence, including the final permit, shall be forwarded to the Designer for record. Availability of final approvals or permits shall be a prerequisite to scheduling a final inspection of the plumbing work.

3.29 INSULATION

A. General: All insulation shall be installed in strict accordance with the manufacturer’s recommendations and shall be applied by a qualified insulation contractor. Covering shall not be applied on any apparatus or piping until the apparatus and piping have been thoroughly cleaned, tested and accepted as tight.
B. Piping: Pipe Insulation where vapor barrier jacket is required shall be installed with vapor barrier jackets drawn tight and firmly sealed to assure a positive vapor seal. End joints shall be covered with 4 inch wide butt strips of material identical to vapor barrier jackets, and they shall be drawn tight and securely sealed. The use of staples to secure insulation where vapor barrier jacket is required will not be acceptable.

C. Fittings and Valves: Cement or molded insulation on fittings and valve bodies shall be same thickness as adjacent covering and finished neatly to match the adjacent pipe insulation. Insulation at hangers, anchors and supports shall be neatly cut and fitted.

3.30 SYSTEM START-UP AND OPERATION

A. The Plumbing Subcontractor shall provide all labor and materials and services necessary for the initial start-up and operation of all systems and equipment furnished and installed under this Section of the Specifications.

B. This Subcontractor shall provide the services of a qualified representative for all major equipment pre-start, set-up, start-up and initial operation. Such periods shall be sufficient to insure proper operation of systems and equipment.

C. This Subcontractor shall check all equipment during initial start-up to insure correct rotation, proper lubrication, adequate fluid flows, non-overloading electrical characteristics, proper alignment and minimal vibration. Systems shall be checked for water flows throughout without blockages.

D. During operation of the systems qualified licensed personnel shall be provided and designated for maintenance of equipment and systems in good running order. Items such as strainer cleanouts, bearing lubrication, packing replacement and other consumables shall be provided without cost to the Owner. Failure of equipment during this period is the responsibility of the Plumbing Subcontractor, and continued failures shall be grounds for the Owner to not accept or pay for the work installed.

3.31 EXCAVATION AND BACKFILL

A. All excavation and backfilling and related work, will be performed under DIVISION 2. The Plumbing Subcontractor shall be responsible for coordination and denoting the proper locations for buried work within the plumbing limits and for monitoring the work to ensure proper trenching, tunneling and backfilling.

B. All work shall be done in accordance with the proper phasing and timing of the work and in accordance with the Plumbing Code.

C. The Plumbing Subcontractor shall be responsible for the final preparation and final grading of all trenches.

3.32 RUBBISH REMOVAL

A. Remove from the site and legally dispose of all cartons of rubbish and debris resulting from work under this Section not less than once per week.
3.33 CORE DRILLING

A. All core drilling required for the installation of the plumbing systems is to be done by this plumbing Subcontractor. This Subcontractor is to carry all costs for core drilling. The General Contractor will not be responsible for any circular penetrations required for the proper installation of the plumbing systems. Locate all required openings and prior to coring, coordinate the opening with the General Contractor and all other trades. Do not disturb existing systems. Thoroughly investigate the existing conditions in the vicinity of the required opening prior to coring. This Subcontractor shall be responsible for damage to the building and its systems from the coring operations. Disturbances from coring shall be kept to a minimum.

- END OF SECTION -
SECTION 230000
HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.01 General Provisions

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of Specifications.

1.02 Description of Work

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. The contractor shall furnish and install high efficiency wall mounted boilers, Tekmar 275 controller with outside air temperature gauge, expansion tanks with all related piping, pipe insulation, boiler circulation pumps (sized as per manufacturer’s recommendation) zone pumps and accessories. HVAC contractor shall furnish and install hot water supply and return piping and insulate all HWS & HWR piping.

2. The HVAC contractor shall furnish and install energy recovery ventilator (ERV) with wall mount controller, concentric vent termination kit, supply and exhaust registers.

3. HVAC contractor shall furnish and install bathroom exhaust fans to include ductwork, wall caps and wall mounted humidity switch for a complete and operable system.

4. Furnish and install electric unit heaters in basement and sprinkler room.

5. The HVAC contractor shall furnish and install fin tube radiation baseboard. Fin tube radiation baseboard shall include accessories including, but not limited to valve access covers, inside corners, outside corners, splice pieces, end caps, etc for a complete installation.

6. HVAC contractor shall furnish combination wall mounted boiler / domestic hot water heater to include piping manifold with boiler circulating pump (Grunfos UPS-26-99-FC 3 speed pump), and Watts HPX -15-BC hydronic accessory package to include expansion tank, air separator, 1/2" service check valve, fill valve with backflow preventer,

7. Furnish and install boiler control system. Boiler control system shall be manufactured by Tekmar, # 275 or as approved.

8. Furnish and install insulation on new heating hot water piping.

9. HVAC contractor shall furnish install clothes dryer exhaust and wall cap. HVAC contractor shall furnish and install dryer exhaust booster fan where indicated on the drawings.

11. Motor starters and interlocking devices where integral with equipment and where specifically noted hereinafter.

12. Furnish and install Chemical Treatment System including chemicals, tank, piping, controls and related equipment.
13. Furnish and install vibration isolation including seismic design; support and restraint of equipment and piping.

14. Motors: ODP and TEFC Type.

15. Furnish operating instructions and maintenance manuals.

16. Record Drawings of the actual HVAC equipment installation.

B. Items to be Installed only: Install the following items as furnished by the designated Sections:

1. SECTION— ELECTRICAL

A. Electrical contractor shall furnish and install apartment exhaust fan. HVAC contractor shall furnish and install 6” diameter duct from exhaust fan to wall cap. Wall cap shall be furnished with exhaust fan and installed by HVAC contractor.

B. Items to be Furnished Only: Furnish following items for installation under designated Section:

1. SINGLE PLY ROOFING SECTION
   a. Prefabricated roof curbs and flashing.

2. ACCESS DOORS AND PANELS SECTION
   a. Access panels to be installed under applicable sections.

C. Related Work: The following items of work are not included in this Section and will be performed under the Designated Sections. Examine all other Sections of the Specifications and all drawings for the relationship of the work under this Section and the work of other trades. Cooperate with all trades and coordinate all work under this Section therewith.

1. The following related items are included under Sections listed below:

2. CAST IN PLACE CONCRETE SECTION
   a. Concrete bases and pads, curbs except for precast and thrust blocks for HVAC equipment, and inertia bases [vibration isolation equipment].

3. DIVISION 2 - SITEWORK
   a. Excavation and backfilling

4. COORDINATION SECTION
   a. Cutting and patching of masonry, concrete, tile and other parts of the structure under and by the APPLICABLE SECTIONS.

5. CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS SECTION
a. Fuel, water and electricity for all tests and temporary operation of HVAC equipment.

b. Temporary heat.

c. Staging, stairs and chutes.

1) Unless otherwise specified in the various trade Sections of the specifications, the General Contractor shall furnish, erect and maintain in safe condition exterior and interior staging, scaffolding and planking over eight feet in height for use by his forces and those of all Subcontractors, without charge, as needed by them for proper execution of their work during the construction of the structures in accordance with existing trade agreements. When the staging is over eight feet in height, the General Contractor is not allowed to backcharge the Subcontractors for the costs associated with the first eight feet of staging. The use of this staging, scaffolding and planking by the Subcontractors shall be coordinated with the General Contractor and performed in a timely manner in accordance with the approved Construction Process Schedule. Subcontractors not performing their work within the established time period indicated for their work in the Construction Process Schedule shall be responsible for providing staging, scaffolding and planking required for the performance of their work. Staging, scaffold and planking shall be of adequate design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

2) The General Contractor shall furnish, install, maintain and remove all temporary ramps, stairs, ladders and similar items as required for the use of all trades for the proper execution of their work.

3) Permanent stairs shall be protected immediately. The General Contractor shall provide same with temporary protective treads, risers, handrails, and shaft protection until substantial completion.

4) The General Contractor shall furnish, install, maintain and remove properly supported covered chutes from openings in the exterior walls of upper floors, and in convenient locations which will permit disposal of rubbish directly into trucks or disposal units.

5. GYPSUM DRYWALL SECTION

a. Openings for Air Intake Devices and Ductwork.

6. MASONRY SECTION

a. Opening for Air Intake Devices and Ductwork.

7. FIRE STOPPING SECTION

a. All fire stopping where required around HVAC pipes and ductwork.

9. ACOUSTIC CEILINGS SECTION

a. Opening for Air Intake Devices and Ductwork.
10. DOORS AND WINDOWS
   a. Undercut doors and door louvers.

11. ROUGH CARPENTRY SECTION
   a. Woodgrounds for fastening air devices. Secure to woodgrounds if provided or directly to wall or ceiling surface if not provided. Provide expansion bolts for masonry - concrete - block wall mounting.

12. SINGLE PLY ROOFING SECTION
   a. Flashing of ductwork and roof curbs for HVAC equipment.

13. SECTION - PAINTING
   a. Painting of all exposed ductwork and other mechanical equipment not having enameled surfaces, stainless steel or chromed finishes except where indicated otherwise in Painting Section

14. PLUMBING SECTION
   a. plumbing piping systems connecting to HVAC equipment.

15. Refer to ELECTRICAL SECTION and, HVAC SECTIONS for division of responsibility of Electrical work. All power wiring of every description shall be provided under SECTION 16100 Electrical, including power to low voltage transformer with related wiring to zone control valves. All starters and controllers for mechanical equipment, except where provided as integral with mechanical equipment, shall be provided under SECTION 16100 Electrical. The wiring for all ATC work, boiler control panel shall conform to provisions as described in ELECTRICAL SECTION. In general, all wiring required for equipment provided by the HVAC Contractor that requires Automatic Controls and all interlocking wiring for this HVAC equipment that is not shown or indicated on the Electrical Drawings of ELECTRICAL SECTION, This work shall also specifically include the following:

   a. All power wiring [110 VAC or greater] to motors. Electrical contractor shall provide 24V transformer with related wiring from thermostat location to apartment zone control valve.
   b. All necessary auxiliary contacts, with buttons and switches in required configuration[s], on magnetic starters.

16. EXTERIOR LOUVERS SECTION
   a. Exterior wall louvers.

F. Reference to Drawings: Contractor shall reference the entire set of drawings.

1.03 Intent

A. All work shall be in accordance with the arrangement, detail and locations, as indicated on the Contract Drawings, Reference Drawings and any supplemental addenda, bulletins or Drawings issued by the Designer. Layouts are diagrammatic and final arrangement of equipment shall suit field conditions. Install all necessary fittings and equipment offsets...
required to meet job conditions. The Drawings are not intended to be scaled, but shall be followed with sufficient accuracy to coordinate with other work and structural limitations. Work installed in a manner contrary to that shown on the Drawings, or interfering with the work of another trade, shall be removed and reinstalled when so directed by the Designer. Discrepancies and questionable points shall be immediately reported to the Designer for clarification.

1.04 Codes, Regulations and Standards

A. All work shall be installed in conformance to the governing Codes, Regulations and Ordinances. It shall be the responsibility of this Subcontractor to familiarize himself with all governing Codes, Regulations and Ordinances and report any non-compliance of the Plans and Specifications to the Designer, prior to entering into a contract. All the above requirements shall take precedence over the Plans and Specifications. These requirements are minimum criteria and no reductions to the quality or capacity of the Systems, that may be permitted by Code, will be allowed without written permission of the Designer.

B. All workmanship methods and materials shall meet the highest standards of the trade and, in general, shall conform to the Standards of the following associations:

- American Standards Associations (ASA)
- American Society of Mechanical Engineers (ASME)
- National Board of Fire Underwriters’ (NBFU)
- Standard of Underwriters’ Laboratories (UL)
  - American Society of Testing Materials (ASTM)
  - American Society of Heating Refrigeration and Air Conditioning Code (ASHRAE)
  - National Electric Code (NEC)
  - Associated Air Balance Council (AABC)
  - National Fire Prevention Association (NFPA)
- Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
- Occupational Safety and Health Act (OSHA)
- American National Standards Institute (ANSI)
- Building Officials and Code Administrators (BOCA)
- Air Moving and Conditioning Association (AMCA)
- National Electric Manufacturing Association (NEMA)
- International Standards Organization (ISO)
- Town of Camden Building Regulations and Ordinances

1.05 Drawings and Conflicts in the Work

A. The Drawings and Specifications are intended to be complementary. Any materials shown or specified in one, but not in the other, reasonably implied and usually included under good industry practice and/or required by applicable Codes and Regulations for the proper and safe completion and operation of the work described herein, shall be furnished and installed by this Subcontractor at no additional cost to the . Drawings show general arrangement of equipment and are not intended to indicate the exact dimension of runs.

1.06 Exchange of Information and Coordination

A. All Systems and equipment covered by this section of the Specifications shall not be installed without first coordinating the installation of same with other trades and the General Contractor. This Subcontractor shall, at his own expense, relocate all equipment installed should they interfere with the proper installation of the equipment to be installed by other trades and by the General Contractor.
B. Particular attention shall be directed to the coordination of systems with all equipment of other trades installed in the ceiling areas. Coordinate, with the other trades, the elevation of all equipment in hung ceiling areas to insure adequate space for the installation of all equipment before said equipment is installed.

C. Furnish to the General Contractor and all other Subcontractors all information relative to the portion of the installation specified in this section that will affect them, sufficiently in advance, so that they may plan their work and installation accordingly.

D. In the case of failure on the part of this Subcontractor to give proper information, as indicated above, sufficiently in advance, this Subcontractor will pay for all back charges incurred by the General Contractor and other Subcontractors for the modification and/or relocation of any portion of the work already performed by them in conjunction with the Contract due to this Subcontractor's delay or for having given information.

E. Obtain from the other trades, all information relative to the work covered by this section of the Specifications, which this Subcontractor is to execute in conjunction with the installation of their respective equipment.

F. In the event that conflicts, if any, cannot be settled rapidly and amicably between the affected trades with work proceeding in a workmanlike manner, then the Designer shall decide which work is to be relocated and his judgment shall be final and binding.

1.07 Workmanship

A. The entire work provided in this Specification shall be constructed and finished, in every respect, in a workmanlike and substantial manner. It is not intended that the Drawings shall show every detail. The Subcontractor shall furnish and install all such parts as may be necessary to complete the work in accordance with the best trade practice.

1.08 Site Investigation

A. It shall be the responsibility of the Bidders to acquaint themselves with the available information, before submitting their bid. Bidders must visit the site and acquaint themselves with the existing conditions and shall study all site/civil, Architectural, Structural, Plumbing, Fire Protection, HVAC and Electrical Drawings, as well as the Specifications. The bidders shall fully inform themselves of all local and state Code requirements. Extra compensation will not be given for obvious conflicts apparent at the time of the start of the project.

1.09 Taxes and Insurance

A. This Subcontractor shall include in his bid, applicable Federal and local taxes and the premiums of the insurance required by the General conditions and Supplementary General Conditions of the Contract.

1.10 Permits and Inspections

A. This Subcontractor shall obtain and pay for all the permits required for this section of the work. He shall also obtain and pay for all the inspections and tests required. Defects discovered in work, materials and/or equipment shall be replaced at no cost to the , and the inspection and test shall be repeated.
1.11 Contract Cost Breakdown
   A. Refer to SUBMITTALS Section
   B. No requisitions will be paid until after the breakdown is delivered to the Designer.

1.12 Guarantee
   A. Refer to CONTRACT CLOSE-OUT Section

1.13 Materials
   A. Materials shall be the best of their respective kinds and in full accord with the most modern mechanical construction. All materials shall be new.
   B. All materials necessary to make the installation complete in every detail shall be furnished and installed under this Contract, whether or not specifically shown on the Drawings or specified herein.
   C. It is the intent of the Specifications that one manufacturer be selected, not a combination, for any particular classification of materials.
   D. Where materials, equipment apparatus or other products are specified by manufacturer, brand name, type or catalog number, such designation is to establish the standard of desired quality and style and shall be the basis of the bid.

1.14 Materials and Equipment Handling
   A. This Subcontractor shall do all handling of his materials and equipment and the resulting cleanup, at his expense, in a safe and satisfactory manner. Special attention shall be paid to the protection of life and property and the equipment or apparatus handled, and any corresponding damages shall be replaced, repaired or paid for by this Subcontractor, as approved by the Designer. This Subcontractor shall provide all rigging, hoisting and staging required to complete the work of this section, unless specifically noted otherwise.

1.15 Shop Drawing
   A. Refer to SUBMITTALS Section
   B. Include for each fan, air handling unit and pump, a performance curve showing duty and horsepower with design operating point indicated clearly.
   C. Submit sound power levels of air terminal units, fans, air handling units and pumps.
   D. Be responsible for presenting the processing of shop drawings to suit manufacturing schedule of equipment and construction schedule of the building.
   E. Be responsible for the accuracy of equipment dimensions relative to available space, the performance and the electrical characteristics. When required, submit a complete comparison between accepted alternative equipment and materials, and that which is specified.
   F. Submit certified Shop Drawings to manufacturer of sound and vibration control equipment and components.
G. Provide information to the General Contractor as required of concrete equipment bases and for any other work to be performed by other trades.

1.16 Record Drawings

A. Refer to CONTRACT CLOSE-OUT Section

1.17 Operating Instructions and Maintenance Manuals

A. Refer to CONTRACT CLOSE-OUT Section

B. Each manual shall contain the following information:

1. Description of each system, with description of each major component of the system.

2. Complete sets of page-size equipment shop drawings including temperature control drawings.

3. A lubrication schedule of all specified equipment.

4. Spare parts list.

5. Equipment identification list with serial numbers.


7. Final balancing reports.

8. Water treatment procedure and tests.

9. Names and telephone numbers of all equipment parts suppliers.

10. "Snap Shot" of Building Automation System Point. List in both "occupied" and "unoccupied" modes.

1.18 Cleaning of Systems

A. Refer to CONTRACT CLOSE-OUT Section

B. Before the Systems are accepted, all equipment shall be thoroughly cleaned to remove all dust, dirt and/or other foreign matter.

C. After the installation is complete, equipment with factory finished surfaces shall be cleaned and damaged or scratched spots shall be touched up with the same type and color paint applied at the factory.

D. All equipment that is to receive finish paint by the Painting Subcontractor and left ready to have surfaces prepared to receive paint.

1.19 Rubbish Removal

A. At the completion of the work, or when ordered by the General Contractor or the Designer, this Subcontractor shall remove from the property, all the rubbish and waste materials belonging to him. Keep the job site free from accumulation of waste materials and

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rubbish; premises must be maintained in a clean condition.

1.20 Temporary Structures

A. This Subcontractor shall provide, on the premises and where directed by the Designer, shall maintain in good condition, and shall remove when directed, suitable and substantial watertight sheds or trailers in which he shall store all his materials and equipment.

1.21 Equipment Access Requirements

A. All work shall be installed so that all parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the Drawings may be made to accomplish this, but changes of magnitude shall not be made prior to written approval from the Designer.

B. Furnish access panels in walls and ceilings at locations indicated on the Drawings, or as required to permit access for adjustment, removal and the replacement and servicing of all equipment, and all other items requiring maintenance and adjustments. Access panels shall be installed by other trades.

C. Coordinate the exact location of access panels in all finished spaces with the Designer.

1.22 Fabrication of Materials

A. Before prefabricating ductwork or piping for installation make certain that such items can be installed as shown on the Drawings without interfering with the structure or the work of other trades. Any problems that cannot be solved in agreement with other trades affected, shall be submitted for decision.

B. If ductwork or piping is prefabricated prior to the investigation and reaching of a solution to possible interference problems, necessary changes in such prefabricated items shall be made at no extra cost to the Owner.

C. In case of any discrepancies between the Specifications and Drawings, or where the Specifications or Drawings are not clear or definite, the subject shall be referred to or decided by the Designer whose decision shall be final. Otherwise, make adjustments at no expense to the Owner.

1.23 Coordination Drawings

A. Conform to the requirements of – COORDINATION SECTION. Before work progresses, in addition to the shop drawings listed herein, coordination drawings shall be prepared by the HVAC and Sheetmetal Subcontractors and reviewed/approved by the Designer at a suitable scale not less than 1/4 inch equals one foot. Provide one sepia and one blue print of the 1/4 inch Sheetmetal HVAC - coordination drawings showing the following:

1. Systems layout coordination drawings of all ductwork, piping and equipment installed under this SECTION showing the adjoining work of other trades at all floors, Mechanical Rooms and duct shafts. Drawings shall indicate all equipment, ductwork and piping with proposed mounting height elevations.

2. Composite systems coordination drawings showing how HVAC Systems are to be installed where conflicts with the work of other trades may occur. The Subcontractor,
before transmittal of the Shop Drawings to the Designer for approval, may required the HVAC Subcontractor and Sheet Metal Subcontractors to revise the composite systems and shop drawings and to make reasonable modifications in the layout of the HVAC work, so that the HVAC work may be properly accommodated without the interference with work of other trades. The HVAC Subcontractor and Sheet Metal Subcontractor shall make such revisions to composite systems coordination drawings, when requested, without extra charge.

3. The HVAC Subcontractor shall be responsible for the cost for changes in the HVAC and adjoining work where an approved substitution of the HVAC equipment requires such changes in the HVAC work or in the adjoining work of any other trade. Provide coordination drawings showing all changes.

4. Sheetmetal ductwork installed in floor areas may be in conflict with ceiling spline system. The Ceiling Subcontractor and the Sheet Metal Subcontractor shall coordinate the method of support for the ceiling spline. In no case shall the ductwork be used to support the ceiling construction nor shall it fall on the grid or its cross points unless the specific areas of conflict are allowed by the Designer.

5. The Balancing Subcontractor shall review the Coordination Drawings for balancing devices and access to said devices and shall stamp and sign the Coordination Drawings upon completion of the review. The HVAC Subcontractor shall install all additional balancing valves and provide all additional access panels and the Sheetmetal Subcontractor shall provide all additional volume dampers to accommodate the Balancing Subcontractors requirements at no cost to the Owner.

1.24 Temporary Services

A. Refer to - CONSTRUCTION FACILITIES and TEMPORARY CONTROL- SECTION

B. Operations necessary for checking, testing and balancing shall be done after written approval is given to start up systems. Before then, ensure that care is taken to protect equipment from damage, and to prevent distribution of dust through duct systems. Cap and seal ducts and cap pipes as required to prevent construction debris from entering.

C. Permanent heating or air conditioning systems shall not be used for temporary heating. The General Contractor shall provide supplementary heating elements as required to bring building to minimum temperatures indicated in specifications sections for individual trades.

1.25 Identification of Mechanical Services

A. After finish painting is complete, identify all mechanical services. Use terminology consistent with the Drawings and Specifications. Refer to Division 1.

B. Use labels.


D. For pipe and ductwork identification provide the following:

1. On ductwork and piping three [3] inches diameter [including insulation] and larger,

E. Locate identification and flow arrows as follows:
   1. On vertical pipes and ducts approximately seven feet above floor.
   2. Behind each access door and panel.
   3. At each change of direction of piping and ductwork.
   4. On each piping and duct branch close to point of connection to main piping and ductwork.
   5. At valves.
   6. At not greater than intervals of 50 feet on straight runs of exposed piping and ductwork, and on both sides of walls.
   8. Identify heat traced piping [if any].

F. Identify all pumps, controls, remote switches, starters, disconnects, pushbuttons and similar equipment as to service with white lamacoid engraved nameplates with black letters. Firmly secure with self-tapping screws. Submit sample plates and lettering for review.

G. Identify all fans [including air handler systems] with the following information:
   1. Tag number.
   2. Design airflow [CFM].
   3. Design external static pressure [in. H₂O].
   5. Area served by unit.

   The label shall be dated and be a minimum of 6” x 4”. The label shall be made of [minimum] heavy duty plastic laminate securely attached to the air handling devices. Submit a sample to Engineer for approval.

H. Provide typewritten master lists in Operating and Maintenance Instruction Manuals; and shop equipment numbers on Record Prints and sepias.

I. Identification shall be consistent with Owner’s standard method of identification.

J. Supply and install 1 1/2” inch diameter, 1/16 inch thick brass tags with 3/8 inch die stamped black letters. Attach to valves with four [4] inch brass chains. Brass tags may be omitted on small valves which isolate a single piece of equipment such as a unit heaters, fan coil unit, and section of radiation.
K. Prepare flow diagrams [same size as record documents] of piping systems to identify equipment and valves. Include these diagrams in record drawings.

L. Insert page-size copies of diagrams into each Operating and Maintenance Manual.

M. Install diagrams, framed under glass, on equipment room walls. Final location shall be as directed on site by the Architect.

1.26 Protection

A. Protect all mechanical work from damage. All ductwork shall be delivered to the site shrink-wrapped or sealed on both sides. Keep all equipment dry and clean at all times. Any temporary identification marks to be applied on the outside of ducts.

B. Cover all openings in equipment, pipes, and ducts with caps or heavy gauge plastic sheeting at the end of each work day until final connections are made with seal removed just prior to continue installation.

C. Correct at no cost to the Owner any damage caused by improper storage, handling, or installation of equipment and materials.

D. Protect equipment, piping and temporary services installed within Section 15500 from weather damage.

1.27 Wiring Diagrams

A. This Subcontractor shall furnish wiring diagrams for all equipment furnished under this section for which wiring is to be installed by the Electrical Subcontractor.
PART 2 - PRODUCTS

2.01 Sheet Metal Work

A. Furnish and install, in an approved manner, all sheet metal work that is indicated on the Drawings, or that is specified or required for the systems of supply, return and exhaust air distribution. All sheet metal work shall be manufactured and erected in a first-class and workmanlike manner, in accordance with the recommendations and requirements as set forth in the latest Duct Construction Standards, published by Sheet Metal and Air-Conditioning Contractors’ National Association, Inc. (SMACNA) and shall be approved, shall be true to the dimensions indicated on the Plans and shall be straight and smooth on the inside, with neatly finished joints. The ducts shall be securely anchored to the building construction in an approved manner, and shall be so installed as to be completely free from vibration under all conditions of operation. All ducts shall be supported in accordance with requirements and recommendations of the SMACNA Duct Manuals. Duct work shall be fitted with splitter dampers, volume dampers, adjustable air scoops and air foil turning vanes to allow complete balancing and to provide the least resistance to air flow.

B. Unless otherwise specified, all low velocity ducts shall be of the best bloom galvanized steel of U.S. Standard gauges specified herein and shall be stiffened by cross-breaking and by use of galvanized rolled steel angles, as specified herein:

<table>
<thead>
<tr>
<th>Rectangular Sizes</th>
<th>Gauge Numbers</th>
<th>Stiffeners</th>
<th>Stiffener Center Spacing</th>
<th>Support Center Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 12&quot;</td>
<td>26</td>
<td>Flat seam</td>
<td>Cross Break</td>
<td>96&quot;</td>
</tr>
<tr>
<td>13&quot; to 30&quot;</td>
<td>24</td>
<td>Standing seams</td>
<td>48&quot;</td>
<td>72&quot;</td>
</tr>
<tr>
<td>31&quot; to 54&quot;</td>
<td>22</td>
<td>1&quot;x1&quot;x 1/8&quot; Angle</td>
<td>48&quot;</td>
<td>72&quot;</td>
</tr>
<tr>
<td>55&quot; and larger</td>
<td>20</td>
<td>1-1/2&quot;x 1-1/2&quot; x 3/16&quot; Angle</td>
<td>24&quot;</td>
<td>60&quot;</td>
</tr>
</tbody>
</table>

C. All duct sizes shown on the Drawings are clear inside dimensions.

D. Ductwork connecting to kitchen hood grille exhaust shall be 16 gauge welded ductwork. Ductwork to be installed slopped @12° per linear foot. Furnish and install access panel at a minimum 20'-0' on center. Ductwork serving kitchen dishwasher condensate hoods shall be manufactured of stainless steel with gauges as indicated within section B.

E. Furnish and install sheet metal plenums for registers, grilles and diffusers. Plenum size shall be size of register, grille or diffuser. Refer to Drawings and/or schedule for sizes.

F. Scaled Shop Drawings of the sheet metal ductwork shall be prepared by the Sheet Metal Subcontractor and submitted to the Designer for review prior to fabricating any ductwork. Drawings shall be minimum 1/4" = 1' 0" scale and shall have sufficient detail to show the coordination of duct runs with the structure and all other components of the building. Refer to COORDINATION DRAWINGS.

2.02 Fire Damper

A. Furnish and install, where indicted on the Drawings and where required by N.F.P.A. and HVAC

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all governing regulations, approved fusible link fire dampers.

B. Fire dampers shall be factory fabricated of 20 gauge galvanized steel and shall have interlocking blades that fold out of the air stream, stainless steel bearings, 160°F. UL listed fusible link and, unless otherwise noted, 1 1/2 hour UL Fire Damper Label. The UL Label shall apply to the entire fire damper assembly for dynamic flow.

C. Each fire damper shall have an air duct access door. Access doors shall be factory fabricated and shall be air-tight when in the "Closed" position.

D. Fire dampers and access doors shall be manufactured by Ruskin Manufacturing Company, Vent Products Company, Inc., Titus Manufacturing Corporation, or equal. Fire dampers shall be installed in accordance with N.F.P.A. requirements.

2.03 Flexible Connections

A. The inlet and outlet of each fan and air-handling unit shall be connected to the ductwork with a flexible connection. Flexible connections shall be secured to inlets and outlets with metal bands held in place with rivets or sheet metal screws. A minimum four inch (4") space shall be maintained between duct and fan connection and the flexible connection shall be made of heavy reinforced canvas, as manufactured by Bauer and Black Company, Iden. Associates, Dur-Dyne Corporation, or equal.

2.04 Balancing

A. The final adjustment of all air and water systems shall be accomplished by an independent Balancing Subcontractor. The Balancing Subcontractor shall be knowledgeable of low velocity air system and all types of water systems. The Balancing Subcontractor shall cooperate with the control manufacturer's representative in setting adjustment of automatically operated dampers, to operate as specified. The Balancing Subcontractor shall inspect all ductwork prior to closing-in to verify to his satisfaction that all fittings, dampers and balancing devices are properly fabricated and installed as specified, and that he will be able to properly balance the systems. All work performed shall be done in full accordance with minimum standards as set forth by the Associated Air Balance Council, N.S.F.M.I., Volume One, No. 81266.

B. As part of the work of this Contract, the Balancing Subcontractor shall make any changes in the pulleys, belts, and dampers or the addition of dampers as required for correct balance, at no additional cost to the Owner.

The Balancing Subcontractor shall furnish to the Designer for approval, four (4) copies of the test data showing the results of the various test requirements specified hereinafter.

C. Test and adjust each air device to within ten percent (10%) of design requirements.

D. Size, type, manufacture of diffusers, grilles, registers and all tested equipment shall be identified and listed. Manufacturer's ratings on all equipment shall be used to make required calculations.

E. Readings and tests of diffusers, grilles, and registers shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.

F. Test and adjust water flow through each radiation unit and water coil to design requirements. List entering and leaving water temperature for each coil.
G. Test and adjust water flow for each water circulator. List GPM water flow, head and motor amperage draw for each circulator.

H. It shall be the responsibility of the Balancing Subcontractor to secure fan and any other equipment data he may require on the HVAC equipment in order for him to complete the balancing as specified herein.

2.05 Insulation Application Requirements

A. Furnish and install covering and insulation, of the type hereinafter specified, on the following sheet metal ducts, pipes, and equipment.

B. All sealers, solvents, tapes, adhesives and mastics used in conjunction with the installation of all insulation specified under this section of the Specifications shall possess the maximum possible fire-safe qualities available and shall be of a type as approved under NFPA #90A and #90B Standards.

C. Insulation shall be applied in a workmanlike manner so as to provide a neat and smooth surface suitable for painting. Work that is poorly done, or done in a manner not conforming to the Specifications and/or Drawings shall be repaired or replaced as directed by the Designer.

D. Insulation shall not be applied to ductwork, piping and related equipment until the systems have been proven tight or pressure tested.

E. Sections of ductwork and equipment may be covered as the work progresses, provided the preceding requirements have been met for pressure testing and tightness.

F. All ductwork, piping, and equipment to be covered shall be clean and dry prior to application of insulation.

G. Insulation shall be carried full thickness through all floor and wall sleeves.

H. All insulation shall be applied with edges tightly butted.

I. All exposed ends on pipe insulation shall be sealed to make a complete vapor-tight installation.

J. Equipment nameplates, labels and equipment access doors shall be left exposed.

2.06 Insulation Materials

A. General Requirements:

1. All insulation shall be installed as per the BOCA Code as a minimum requirement for piping, ductwork and equipment specified hereinafter.

2. All insulation for transfer air ductwork internally insulated shall be Thermal/Acoustic Vapor Barrier insulation as specified under Sheetmetal.
3. All internal insulation for ductwork shall be provided by the Sheetmetal Subcontractor.

4. All external insulation including piping and ductwork and equipment shall be provided by the Insulation Subcontractor.
   a. Piping to be insulated shall include all piping [hot and cold surfaces]
   c. Equipment to be insulated shall be indicated

5. All valves and fittings of all piping and equipment indicated to be insulated shall also be insulated.

6. No insulation shall be applied to any surface subject to air or hydrostatic tests, until after such tests have been completed and the systems accepted as tight against leakage.

7. Insulation need not be provided under this item for the following:
   a. Pneumatic piping systems [if any].
   b. Fin tube piping within radiation enclosures.

B. Definitions

1. Insulation thickness shall include insulation and factory applied jacket if the jacket is included in the manufacturer's published dimensions. The thickness shall not include thickness of the mastic applied over the insulating material.

C. Flame Spread and Smoke Development:

1. All components of all insulation systems hereinafter specified, including coverings, mastics, and adhesive shall conform to the requirements of the National Fire Protection Association No. 90A “Standard for the Installation of Air Conditioning and Ventilating Systems”. Flame spread and smoke development ratings shall be established by tests conducted in accordance with NFPA No. 225 “Method of Test of Surface Burning Characteristics of Building Materials”. Flame spread rating not to exceed 25; fuel contributed and smoke development rating not exceeding 50 when tested in accordance with ASTM E84.

D. Shop Drawings:

1. Shop Drawings shall be submitted for all insulation components and integrated insulation assemblies.

E. Insulation Subcontractor

1. Attain a complete and continuous vapor barrier over insulation applied to cold and dual temperature piping, sheetmetal and equipment. Use either factory applied vapor barrier, all service jacket or field applied reinforced Foil Flame Resistant Kraft [R.F.F.R.K.] vapor barrier jacket. Apply to piping, fittings, valves, and inline components, sheetmetal and fittings and equipment.

2. Seal longitudinal and circumferential laps with Benjamin Foster 82-07 Flintkote 230-04 HVAC

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or equal. Apply to piping, fittings, valves and inline components, sheetmetal and fittings, and equipment. If vapor barrier jacket is not lapped, seal joints with self-adhering 4 inch wide plain aluminum foil tape, or adhere 4 inch wide plain aluminum foil tape, or adhere 4 inch wide aluminum foil tape with Benjamin Foster 92-07 or Flinkote 230-04 or equal adhesive.

3. All insulation pertaining to Section 15500 HVAC shall be carried out by one firm specializing in insulation work.

F. Pipe Insulation:

1. On hot piping applications, insulation shall be held in place with flare type staples. Seal the raw edges of insulation as noted above.

2. On cold and dual temperature piping applications, apply vapor barrier jacket and seal longitudinal and circumferential laps. Further secure with staples applied to ensure vapor barrier. Seal the raw edges of insulation as noted above.

3. Provide 0.016 corrugated aluminum seamless jacket joined with rivets on exposed pipe within 9’0” above finished floor or where susceptible to damage in finished occupied spaces, not mechanical rooms. Bracket pipe every four feet off of wall. Jacket to be joined at lap seam by rivets every three [3] inches on center.

4. Apply vapor barrier over insulation on cold and dual hot/cold temperature piping.

5. Insulate fittings and valves with fabricated mitered or performed sections of specified insulation with PVC fitting covers. Insulate and finish with and reinforce with a glass membrane material. PVC fittings, if used, shall be installed in strict accordance with manufacturer’s printed directions.

6. Insulate over flanges and flange valves with specified insulation and thickness sized to suit flange diameters as described hereinbefore for fittings.

7. Insulate chilled water pumps.

8. Do not insulate terminal unit automatic control valves installed in hot piping. Insulate all unit coil automatic control valves which are installed in cold piping.


10. Insulated pipe on all low temperature systems, and hot systems where roll hangers are used must be supported by hangers on the outside of the insulation. Special high density inserts of calcium silicate cellular glass or other approved material of the same thickness as adjacent insulation shall be installed at points of hanger support. Insulation inserts shall be either 180 degrees or 360 degrees and not less than 18 inches in length. The entire insert shall be covered with a vapor barrier facing of the same appearance and quality as the facing on adjacent covering. Saddles or shields shall be provided by the HVAC Subcontractor.

11. Pipe insulation for all piping except where indicated otherwise, shall be of the following type, and as scheduled in the Pipe Insulation Table.

a. Fiberglass Pipe Insulation with factory applied fire retardant all service jacket. Density of insulation shall be 4.0 pounds per cubic foot.

b. Where provided for the cold pipe, fiberglass type ASJ jacket with factory supplied HVAC 23 0000 - 17
but strips on cold and dual temperature applications and self-seal lap adhesives on longitudinal and butt joints shall be used.

12. Pipe and Equipment Insulation Table:

<table>
<thead>
<tr>
<th>Duty</th>
<th>Thickness</th>
<th>Vapor Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic cold water connecting to HVAC equipment</td>
<td>Thickness &amp; type to match attached plumbing piping</td>
<td>Yes</td>
</tr>
<tr>
<td>Hot water [except piping within radiation enclosures].</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1” and less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 1/4” to 4”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation Conductivity B/F. hr. sf. at temp F to equal 0.25 at 125°F required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5” and larger</td>
<td>1 1/2”</td>
<td>No</td>
</tr>
<tr>
<td>For runouts up to 2” diameter and 12 ft. or less in length</td>
<td>1 1/2”</td>
<td>No</td>
</tr>
<tr>
<td>Chilled water.</td>
<td>2”</td>
<td>No</td>
</tr>
<tr>
<td>Insulation Conductivity 0.23 at 75°F required.</td>
<td>1/2”</td>
<td>No</td>
</tr>
<tr>
<td>1” and less</td>
<td>1”</td>
<td>Yes</td>
</tr>
<tr>
<td>1 1/4” to 2”</td>
<td>1 1/2”</td>
<td>Yes</td>
</tr>
<tr>
<td>2 1/2” to 6”</td>
<td>1 1/2”</td>
<td>Yes</td>
</tr>
<tr>
<td>8” and larger</td>
<td>1 1/2”</td>
<td>Yes</td>
</tr>
<tr>
<td>Refrigerant piping [suction pipe only] - Armaflex, Imco lock/Imco-shield by IMCOA, or InsulTube by Halstead Ind., or equal insulation with exterior material sealed.</td>
<td>1”</td>
<td>Yes</td>
</tr>
<tr>
<td>Condensate drains both gravity &amp; pumped</td>
<td>1”</td>
<td>Yes</td>
</tr>
<tr>
<td>HVAC 23 0000 - 18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
G. Sheetmetal Insulation [External]:

1. Prior to finishing of insulation of hot and cold exposed rectangular ductwork, supply and install corner beads similar to roll-on-type.

2. Apply vapor barrier over insulation on cold and dual temperature ducts. Utilize insulation manufacturer approved mastics, adhesives, etc.

3. Ductwork lined with acoustic insulation shall not be externally insulated.

4. Fire dampers, reheat coils, duct coils, flow measuring stations, sound attenuators, acoustic plenums, static pressure measuring stations, i.e., all items that are not furnished lined by manufacturers that are installed in a lined or insulated duct system, shall be externally insulated.

5. External sheetmetal insulation shall be one of the following types, and as scheduled in the sheetmetal insulation table.

   a. Type D1:

   Fiberglass rigid duct insulation 6 pounds per cubic foot density. Impale insulation on mechanically fastened pins located at not greater than 12” centers. Secure insulation with speed washers. seal all penetrations and butt joints with matching vapor barrier type material. Insulation to have FSK vapor barrier. Provide corner beads on ductwork located within 6 feet of floor.

   b. Type D2:

   Fiberglass flexible duct insulation 3/4 pounds per cubic foot density with FSK vapor barrier facing. Blanket insulation shall be wrapped around ducts with points tightly butted together or lapped. Maximum compression after installation shall be 25%. Insulation shall be wrapped tightly on the duct work with all circumferential joints butted and longitudinal joints overlapped a minimum of 2”. Adhere insulation to metal with 4” strips of insulation bonding adhesive at 8” O.C. Additionally secure insulation to the bottom of rectangular ductwork over 24” wide with mechanical fasteners at not more than 18 O.C. On circumferential joints, the 2” flange of the facing shall be secured using 9/16” flare-door staples applied 6” O.C. and taped with minimum of 3” wide foil reinforced kraft tape. On Longitudinal joints, the overlap shall be secured using 9/16” flare-door staples applied 6” O.C. and taped with minimum 3” wide foil reinforced kraft tape. In exposed applications cover all joints with 3” wide Foil Reinforced Kraft tape. All laps, seams, punctures, staples, etc. shall be taped and sealed over the lamps with vapor barrier mastic.

6. Sheetmetal Insulation Table:

<table>
<thead>
<tr>
<th>Duty</th>
<th>Insulation Type</th>
<th>Thickness</th>
<th>Vapor Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Ductwork:</td>
<td>D2</td>
<td>1 1/2”</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Do not provide where HVAC

23 0000 - 19
ductwork is exposed in the space it serves

Panels behind unused portions of louvers [Sheetmetal Subcontractor to provide metal panels.

Outside air plenums and ducts. Mixed air plenums and ducts.

<table>
<thead>
<tr>
<th>Duty</th>
<th>Insulation Type</th>
<th>Thickness</th>
<th>Vapor Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief &amp; exhaust air plenums, and ductwork from plenum to automatic in duct damper.</td>
<td>D1</td>
<td>1 1/2”</td>
<td>No</td>
</tr>
<tr>
<td>Boiler breeching and domestic water heater breeching [which is not in a premanufactured insulated, double walled system].</td>
<td>1200°F mineral wool with 1” diamond mesh screen &amp; 1/2” trowelled plastic cement and rewettable glass cloth cover</td>
<td>3” for</td>
<td>No breeching</td>
</tr>
</tbody>
</table>

H. Equipment Insulation:

1. Insulation over 1 1/2” thickness shall be applied in two layers, with staggered joints.

2. Apply vapor barrier over insulation on cold and dual temperature equipment.

3. Equipment insulation shall be one of the following types, and as scheduled in the equipment table:

   a. Type E1:

      Fiberglass 4.5 pounds per cubic foot density. Cut and miter insulation to suit surface contours. Impale insulation on mechanically fastened pins located at not greater than 12” centers. Apply expanded metal lath and lace edges with 16 gauge, galvanized, annealed wire. Secure insulation and metal lath with 1 1/2” O.D. speed washers. Apply two 1/2” coats of hydraulic setting insulation cement. Second coat shall be mixed with 25 percent Portland cement. Allow to dry to smooth finish before recovering.

   b. Type E2:

      Closed-cell neoprene sheet, 5.7 pounds per cubic foot density. Apply to clean and dry metal surfaces to be joined. Use the manufacturer’s compression fit method of butt jointing sheets.

4. Equipment Insulation Table:
### HVAC

<table>
<thead>
<tr>
<th>Duty</th>
<th>Insulation Type</th>
<th>Thickness</th>
<th>Vapor Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air separators Hot Water</td>
<td>E1</td>
<td>2 1/2”</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duty</th>
<th>Insulation Type</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expansion Tanks - Hot Water</td>
<td>E1</td>
<td>2 1/2”</td>
</tr>
</tbody>
</table>

### I. Protection

1. Protect the work of other trades with tarpaulin.

2. Protect the work of this trade from being defaced by other trades. Correct any damage and leave in perfect condition, ready for final painting.

### J. Installation

1. Apply insulation over clean, dry surfaces, firmly butting all sections together.

2. Do not cover equipment nameplates.

3. Access doors in ductwork and equipment shall be insulated to same degree as the duct work and equipment and insulation shall allow proper use of door. Name plates and equipment information shall not be covered.

4. Any insulation which becomes wet or damaged before the installation is approved shall be removed and replaced. Protect insulation from damage and notify the general Contractor for his cooperation.

### 2.07 Sleeves and Plates

A. Sleeves and plates shall be black steel, Schedule 40, in accordance with A.S.T.M. Specification A-120, for pipes passing through concrete or masonry and 24 gauge galvanized sheet metal for pipes passing through plaster or gypsum board.

B. Sleeves shall be provided at all joints where pipes pass through concrete, masonry, plaster or gypsum board. They shall be sized so as to provide for pipe covering and for lateral expansion. The ends shall be flush with finish surfaces.

C. In locations where water may accumulate on floors, such as Toilet rooms, extend sleeves one inch (1”) above the finished floor and seal watertight.

### 2.08 Piping Systems Materials

A. Piping shall conform to the following requirements. All materials shall be new and shall be installed as specified under Paragraph 2.10 "Piping Systems Installation".

B. The material of construction shall be as follows:

1. Hot water piping, chilled water piping, water treatment piping shall be Schedule 40 steel pipe, ASTM A54. Two inch (2”) size and smaller shall be screwed construction. Larger than two inch (2”) pipe shall be welded construction.

2. All condensate drain pipe shall be Schedule 40 steel, galvanized, all-screwed
construction and shall have a cleanout at each change of direction.

3. City make-up water pipe [cold water] shall be Type "L" copper with 95/5 soldered joints.

2.09 Piping Systems Installation

A. Installation of pipe, fittings and valves:

1. Furnish and install piping approximately as indicated, straight, plumb and as direct as possible; form right angles on parallel lines with building walls.

2. Keep pipes close to walls, partitions and deck. Offset only where necessary to follow walls, or to avoid existing equipment and obstructions.

3. Locate groups of pipes parallel to each other; space them at a distance to permit applying full insulation and to permit access for servicing valves.

4. Piping shall be accurately cut to measurements established in the field and worked into place without springing or forcing.

5. All piping shall be reamed to be free of burrs.

6. Keep pipes free from scale and dirt; protect open pipe ends, whenever work is suspended during construction, to prevent foreign bodies from entering and lodging there; use temporary plug, or other approved material for protection.

7. Drain valves shall be located at the base of all low points in the piping systems, and where required to allow complete draining of the systems. Drain valves shall be 3/4 inch globe valves with 3/4 inch hose threaded adapters, metal cap and chain.

8. Install chromium-plated escutcheon plates at all exposed locations where pipes pass through walls, floors and ceilings. Screw escutcheon plates to the structure with tamper-proof screws.

9. All connections of dissimilar metals shall be made with a dielectric fitting designed to separate dissimilar metals.

B. All connections to apparatus two inch (2") diameter and smaller shall be made with 250 pound brass seat unions. All connections to apparatus 2 1/2 inch diameter and larger shall be made with welding neck flanges to match flanges on valves or apparatus to which attached.

C. All welded fittings shall be made of the same weight and material as the piping to which attached. Tee welds reducing one size or less shall be made with welding tees of the same manufacturer as the welding fittings. Tee weld reducing more than one size shall be made with welding tees of the same manufacturer as the welding fittings or with forged branch welding outlet fittings. All piping to be welded shall be cut off clean and beveled. All welding slag shall be removed. Unless otherwise indicated, all welding elbows shall be long radius elbows. Fishmounting or field-fabricated nipples will not be allowed.

D. Certified Welders - Pipe welds shall be made only by operators who have been qualified by the National Certified Pipe Welding Bureau and the Operator's Qualification Record shall be submitted to the Engineer on Form Q-1, Manufacturer's Record of Welding Procedure Qualification Test, Page 55, 1986 Section IX ASME Boiler and Pressure
Vessel Code, before any work is performed. The certification date shall be within 12 months of awarding of the Contract. Any pipe welds performed before the Designer has reviewed the Welder's Qualification Record will not be accepted and will be subject to re-welding at the Subcontractor's expense.

E. Expansion -

1. Provide for taking up expansion in steam and condensate pipes by means of loops, offsets, guides and anchors.

2. Use swing or swivel joints for connections from mains to risers and from risers to heating and cooling units.

2.10 Valves

A. Piping System valves shall conform to the requirements as hereinafter specified. Valves shall be installed as shown on the Drawings and as herein specified.

B. Gate Valves

1. Gate valves two inches (2") size and under shall have 125 pound WSP bronze bodies and trim, screwed ends, integral seat, solid bronze wedge disc, screw-on bonnet and ISRS stem, Jenkins Figure No. 370; Crane Figure No. 138; Nibco Incorporated or equal.

2. Gate Valves 2 1/2 inches and larger shall have 120 pound WSP cast iron bodies, all bronze trim, flanged ends, replaceable bronze seat, solid bronze-faced iron disc, bolted bonnet, and O.S. & Y. stem. Jenkins Figure No. 6510A; Crane, Figure No. 465-1/2, Nibco, Incorporated or equal.

C. Globe Valves

1. Globe valves 2 inch size and under shall have 125 pound WSP bronze bodies and trim, screwed ends, integral bronze seat, replaceable composition disc, screw-on bonnet and ISRS stem, Jenkins Figure No. 106A; Crane Figure No. 7; Nibco Incorporated or equal.

2. Globe valves 2 1/2 inch and larger shall have 125 pound WSP cast iron body with bronze trim, flanged ends, bolted bonnet and O.S.& Y. stem. Jenkins Figure No. 359; Nibco Incorporated or equal.

D. Ball Valves

1. Ball valves 2 inch size and under shall have 125 pound WSP bronze bodies and trim, TFE seats and seals, screwed ends or soldered ends for copper pipe and plastic-coated steel lever type handle, Jenkins, Crane, Nibco Figure No. 580 or equal.

E. Horizontal Swing Check Valves

1. Horizontal swing check valves two inch (2") and under shall have 125 pound WSP bronze bodies and trim, screwed ends, integral bronze seat, re-grindable bronze disc and screw-on cap. Jenkins Figure No. 92A; Crane Figure No. 34; Nibco Incorporated or equal.
2. Horizontal swing check valves 2 1/2 inch and larger shall have 125 WSP cast iron bodies with bronze trim, flanged ends, replaceable bronze seat; renewable, regrindable bronze disc and bolted cover. Jenkins Figure No. 85; Crane Figure No. 373-1/2F; Nibco Incorporated or equal.

F. Vertical Lift Check Valves

1. Vertical lift check valves two inch (2") and smaller shall have 150 pound WSP bronze bodies and trim, screwed ends, integral bronze seat, renewable composition disc and screw cover cap. Jenkins Figure No. 119; Fairbanks Figure No. 0612; Nibco Incorporated or equal.

2. Vertical lift check valves 2 1/2 inch and larger shall be silent type with semi-steel, 125 pound, wafer type body, replaceable bronze seat and plug, stainless steel spring and retaining screws. Combination Pump and Valve Company, Catalog No. 10B; Metrafex Series No. 700; Meuller No. 101-A-A or equal.

G. Plug Valves (Balancing Valves)

1. Plug valves two inch (2") size and smaller shall have 125 pound WOG semi-steel bodies, screwed ends, teflon-coated tapered plug, plug retainer plate, separate gland adjustment and shall be wrench-operated. Valves shall be provided with proper lubricant and not less than two (2) wrenches for each valve size. Valves shall be Rockwell-Nordstrom Figure No. 114; Powell Figure No. 2202; Nibco Incorporated or equal.

2. Plug valves 2 1/2 inch size and larger shall have 125 pound WOG semi-steel bodies, flanged ends, teflon-coated tapered plug, plug retainer plate, bolted gland adjustment and wrench operators. Valves shall be provided with proper lubricant and not less than two (2) wrenches for each valve size. Valves shall be Rockwell-Nordstrom Figure No. 115; Powell Figure No. 220, Nibco Incorporated or equal.

H. Butterfly Valves

1. 2 1/2 inch and larger butterfly valves rated for 200 psi.
   a. Valves shall be capable of conversion to an actuated operation or chainwheel operation. Provide with chainwheel and chain for valves located higher than six [6] feet above floor.
   b. Valves 6 inch and under shall be complete with ten position lever operator with adjustable memory stop plate and totally enclosed weatherproof screw gear operator with handwheel on valves 8 inch and larger with position indicator.

   1] Rated for 200 PSI Service: butterfly valves shall be installed between ANSI B 16.1 cast iron 125 lb. or ANSI B 16.5 forged steel 150 lb. flanges; 2” through 20” shall be full threaded lug style to allow the flange of either side of the valve to be removed with the valve remaining in place to provide full equipment isolation. Valve body shall be cast iron [ASTM A-126, Class B] with 2 inch minimum neck for full insulation. Lugged valves shall have mechanically retained seat and shall provide tight shutoff on dead-end or isolation service without the use of downstream flanges. Discs shall be aluminum bronze. Shafts shall be 416 stainless steel and be supported on three [3] self-lubricating bronze or TFE coated stainless steel bearings. Valve seats shall be hard backed phenolic cartridge EPDM liner.
I. Temperature Control Valves: All temperature control valves shall be furnished by the Temperature Control Subcontractor and installed by this Subcontractor. All valves shall be installed by HVAC Subcontractor as directed by the Temperature Control Subcontractor.

2.11 Piping Supports and Hangers

A. Furnish and install all pipe supports, hangers and other suitable supporting appliances necessary to support firmly and substantially, all parts of the apparatus described in this Specification.

B. Support Spacing - All piping 1/2 inch and smaller shall be supported every six feet (6'); 3/4 inch and one inch pipe every eight feet (8'); 1 1/2 inch and larger pipe diameter shall be supported at a distance not greater than ten feet (10') by means of hangers and supports, as described herein.

C. Pipe Saddles - Pipe covering protection saddles shall be installed at each pipe hanger for steam and condensate piping. The pipe covering protection saddles shall be as manufactured by Carpenter and Paterson, Inc., F. & F., Grinnell or equal and shall be tack-welded to the pipe.

D. Pipe Support Types

1. All piping 2 1/2 inch in diameter and larger shall be supported by pipe rolls with one, 5/8 inch adjustable wrought iron rod hanger secured to the structure with concrete inserts or beam clamps, except where noted otherwise on Drawings.

2. All piping two inch (2") diameter and smaller shall be supported by clevis hangers with one, 3/8 inch wrought iron rod secured to the structure with concrete inserts or beam clamps, except where noted otherwise on the Drawings.

3. Pipe rings or strap hangers will not be accepted.

4. Submit all pipe hangers for approval and receive approval prior to installing any pipe.

E. Pipe Anchor Framing -

1. Framing for pipe anchors is to be connected to main framing in a manner acceptable to the Designer and shall be submitted to the Designer, for approval, prior to installation.

2. All anchors shall be constructed from heavy forged wrought iron angles welded to the pipe and securely fastened to the masonry construction or structural steel.

F. Vertical piping shall be supported by wrought iron riser clamps or base elbows, as required.

2.12 Pressure Gauges

A. Pressure gauges shall be manufactured by Ashcroft, Therice, Manning Maxwell and Moore or equal. Gauges shall have 2 1/2 inch diameter case, phosphor bronze bourdon tube and one percent (1%) full scale accuracy. Gauge range shall be 0 to 60 PSI. All gauges shall be installed with pulsation dampeners and petcocks.

2.13 Thermometers
A. Thermometers shall be as manufactured by Mueller Company, Taylor Company, Foxboro Company or equal. All thermometers shall be industrial type with nine inch (9") scale, perma-colored liquid, black scale divisions on white face, union hub, separable brass well and completely adjustable base.

B. Thermometers shall have 2 scale divisions and shall be mounted in the line so that the scale is upright and easily read from the floor.

2.14 Strainers

A. Strainers shall be provided on the inlet side of all temperature control valves and pressure regulating valves as indicated on the Drawings.

B. All strainers shall be provided with blow-down valves of the full size of the plug connection. The discharge from the blow-down valves shall be capped.

C. Strainers two inch (2") size and smaller shall have 125 pound WSP iron Y-body, screwed ends, stainless steel 20 mesh screen or 1/32 inch perforated plate. Strainers shall be Armstrong Machine Works Model AISC, Crane Company Figure No. 900-1/2; Sarco Type AT; Yarway Figure No. 901; or equal.

D. Strainers - 2 1/2 inch size and larger shall have 125 pound WSP iron Y-body, flanged ends and perforated brass screen. Strainers shall be Meuller No. 751; Armstrong Machine Works Model AIFL; Crane Company Figure No. 989-1/2, Sarco Type D, Yarway Figure No. 804; or equal.

2.15 Flexible Pipe Connectors

A. Flexible pipe connectors shall be as manufactured by Keflix, Johnson Hose, Flexonics or equal. Flexible connectors shall be of stainless steel and rubber construction with minimum 150 PSIG working pressure rating. Connectors shall be installed with maximum 1/4 inch misalignment and mounted so that equipment or piping loads are not subjected on the flexible sections. Connectors in refrigerant piping shall be designed for service with the refrigerant used. Connectors in hot water piping shall be designed for operation with 220°F water or greater.

2.16 Cleaning and Flushing

A. The following procedure shall be considered as minimum preparation for the water piping systems and shall be accomplished sequentially as erection progresses and in such a manner as to prevent contamination of any previously prepared section of piping.

B. At the time of initial fill for the system or part thereof, there shall be added not less than 50 pounds per each 1000 gallons of contained water, a powder blend of an alkaline detergent comprised of the following ingredients:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soda Ash</td>
<td>40%</td>
</tr>
<tr>
<td>Sodium Silicate Penthydrate</td>
<td>35%</td>
</tr>
<tr>
<td>Sodium Tri-polyphosphate</td>
<td>24%</td>
</tr>
<tr>
<td>Wetting Agent, Non-ionic</td>
<td>1%</td>
</tr>
</tbody>
</table>

Water containing this detergent shall be circulated for not less than six (6) hours at a velocity of not less than one foot (1') per second, after which the systems shall be rapidly emptied with circulating pumps operating and wherever possible, simultaneously adding HVAC.
or chasing with rinse water.

In any case, the systems shall be flushed until all construction material and foreign debris is removed. After flushing, all strainers shall be removed and cleaned.

D. As soon as possible after completion of the flushing and with clean water in the systems, the systems shall be treated with chemicals selected by a chemical treatment manufacturer to provide protection from scale, corrosion, oxidation deposits or other precipitates which may be harmful to the systems. Selected chemicals shall not be harmful to any component of the systems and shall be suitable for disposal in the building drainage system. Data on chemicals selected shall be submitted to the Designer for review.

2.17 Piping System Pressure Tests

A. All piping systems and equipment furnished under this Section of the Specifications shall be subjected to a pressure test prior to being concealed or insulated. This Subcontractor shall furnish all temporary connections required for testing, shall isolate equipment which may be damaged by the testing and shall provide all pressure gauges and other equipment required for the pressure tests. At least two days notice shall be given to the Designer prior to pressure testing.

1. Piping shall be tested at not less than 100 PSIG hydrostatic pressure for a period of four (4) hours. There shall be no pressure loss at the end of the test period.

2.18 Electric Motor Characteristics

A. Electrical motors shall conform to the requirements of IEEE, NEMA, UL, N.E.C., F.M. and NFPA suitable for load conditions, squirrel cage, 1.15 service factor, drip proof, 1750 rpm unless otherwise noted, with inherent overload protection and pressure lubricated bearings with grease fittings. Provide totally enclosed fan cooled motors as noted within the specifications. Refer to Section 16100 ELECTRICAL for Electrical Characteristics Requirements.

B. Motors below 1/2 HP shall be 120V - 1 phase. Motors that are 1/2 HP and greater shall be 460V - 3 phase. Motors that are 40 HP and larger shall have reduced voltage starters provided by SECTION 16100. All other motors shall be designed for use with across-the-line starters. Motors to be provided with overload protection. Provide two speed motors with two windings where two speed motors are noted on the drawings or in this specification including Section 15500-2.22.

C. Belt driven equipment. Motors shall be mounted on adjustable sliding bases, except fractional motors shall be mounted on slotted bases.

D. Greater than 1 HP: cast construction, roller or ball bearings. Fractional: sleeve or ball bearings capable of end thrust equal to weight of motor, rolled or case and shield.

E. Motor leads shall be permanently identified and supplied with connectors.

F. The minimum requirements for three phase motors shall be NEMA Design B, Class B, insulated for a maximum 40 degrees C [104 degrees F] ambient.

G. Select motors for quiet, continuous operation to suit loads which may be imposed by equipment. Recognize that motor horsepower specified and scheduled are minimum sizes. If larger motors are required, ensure that extra costs of larger motors, starters,
power wiring and additional control wiring are included in bid.

H. Motors located within the air streams shall be selected to operate satisfactorily at maximum temperature and moisture levels or surrounding air.

I. Submit an accurate schedule of all motors. Include for each motor, the HP, RPM, nameplate, current, equipment served, location, electrical characteristics, and identification number.

J. All standard 1200, 1800 and 3600 RPM, ODP motors 1 HP and above shall be premium efficiency. Premium efficiency motors shall meet or exceed the following factors which are the product of the motor power factor [under rated load condition] multiplied by the motor efficiency: 1 HP = 0.714, 1 1/2 HP = 0.714, 2 HP = 0.714, 3 HP = 0.744, 5 HP = 0.752, 7 1/2 HP = 0.767, 10 HP = 0.767, 15 HP = 0.779, 20 HP = 0.785, 25 HP and 30 HP = 0.791, 40 HP and 50 HP = 0.800, 60 HP and 75 HP = 0.803, 100 and 125 HP = 0.808, 150 HP and above = 0.811. The minimum power factor shall be 85% in accordance with Article 31 of the Massachusetts State Building Code. Equipment motors which must be corrected shall attain a minimum of 90% power factor in the as-built, final balancing arrangement where if less than this, under actual load conditions, shall be corrected by at least 90% [by the use of capacitors provided by the equipment manufacturer]. Provide premium efficiency motors for all 1200, 1800 and 3600 RPF TEFC motors.

K. All motors connect to variable frequency drives [fans] shall be provided with insulated bearings.

2.19 Piping System Air Vents

A. Piping system air vents shall be provided where indicated on the Drawings and at the high points of all water piping sections. Vents shall be key-operated.

2.20 Water Make-Up Pressure-Reducing Valves

A. Pressure-reducing valves shall be the adjustable type and shall be as manufactured by Bell and Gossett, No. 6; Taco No. 319; Thrush No. 21 or equal.

B. The valves shall be suitable for up to 100 PSI inlet pressure and shall be adjusted to the system operating pressure. Furnish and install valve inside the building so that the water can be drained for winter months.

2.21 Water Circulating Pumps

A. Provide vertical in-line pumps, single stage, single suction type, with pump characteristics which provide rising heads to shut off. Refer to pump schedule for pump flows, heads, motor speed, enclosure, efficiency and power requirements. Pump shall be as manufactured by Grundfos, Thrush, Goulds or equal.

B. Pumps shall be split coupled type, with rigid spacer type coupling.

C. Pump Construction:

1. Pump Casing - Cast iron for working pressure below 175 psig at 150°F [125 psig ANSI flange rating]. Suction and discharge connections shall be flanged and the same size and shall be drilled and tapped for seal flush and gauge connections.

2. Impeller - Bronze, full enclosed type. Dynamically balanced.
3. Shaft - Provide stainless steel pump shaft.

4. Coupling - Rigid spacer type of high tensile aluminum alloy. Couplings shall be split to allow removal from pump and motor shafts, leaving space between the shafts sufficient to replace all mechanical seal components without disturbing the pump or motor.

5. Mechanical Seals - Shall be stainless steel outside multi-spring balanced type with Viton secondary seal. Provide bronze gland plate with stainless steel hardware. Provide factory installed flush line with manual vent.

6. All split coupled pumps shall be provided with a lower seal chamber throttle bushing.

7. Motor Horsepower - Shown on the schedule are minimum and have been sized for continuous operation without exceeding full load nameplate rating over the entire pump curve, exclusive of service factor.

8. Seal flush line fittings, if required: Supply in the flush line to the mechanical seal a 50 micron cartridge filter and sight flow indicator, to suit the working pressure encountered. Filters shall be changed, by the HVAC Subcontractor, after system is flushed and on a regular basis until turned over to the Owner.


2.22 Air Separators

A. The air separators shall be of the size required to pass the Hot Water and Chilled Water System water flow for each system. The air separators shall be manufactured by Bell and Gossett, Taco, Dunham-Bush or equal. The air separators shall have an inlet, outlet, expansion tank and drain pipe connection and shall be of a heavy cast iron construction.

2.23 Compression Tanks and Fittings

A. The compression tanks shall be of the size and capacity indicated on the Drawings. The tanks shall be manufactured by Bell and Gossett Company, Taco, Thrush or equal.

B. Each tank shall be ASME labeled and shall be equipped with gauge glass with petcocks, tank drain and charge valve.

C. Each tank shall be mounted floor mounted.

2.24 Fluid Heat Transfer

A. Water Flow Measuring Devices

1. Provide complete flow measuring system as shown on the Drawings and as required for measuring flow in each of the chilled water, hot water and condenser water circulating systems. The flow meter shall be portable and calibrated to read the flow of water directly in GPM. Flow meters shall be annular type as manufactured by Presco, Ellison Instrument Division, Taco or Bell & Gossett.

2. Flow meter fittings shall be installed in the following piping systems and where indicated on the drawing and for location for balancing and testing purposes.

a. Pumps P-1, P-2,

B. Compression tanks (expansion tanks) shall be of size and capacities shown. Tanks
shall be as manufactured by Bell and Gossett Company, Taco or Thrush. Tanks shall be ASME labeled and equipped with tank drains and tank fittings.

C. Piping shall be installed to provide for and control movement due to thermal expansion or contraction.

2.25 Starters and Controllers

A. Motor driven equipment supplied under Section 230000 shall be operated by starters furnished and installed under ELECTRICAL SECTION unless otherwise listed for starters integral with HVAC equipment or variable frequency drives which shall be provided by the HVAC Subcontractor.

B. The HVAC Subcontractor shall provide nameplates on all starters furnished under and for use on motor driven equipment provided under

C. All motor controls shall conform to NEMA Standards and be the product of a single manufacturer; Arrow-Hart and Hagemen, Allen-Bradley, Square D or equal.

D. Auxiliary contacts shall be included on all starters provided under SECTION 16100, ELECTRICAL and by Section 15500, for integrally mounted starters. Auxiliary contacts shall be provided for all interlocking wiring as per Automatic Temperature Controls requirements and for Automation Interface.

E. Starters shall normally be provided with two sets of contactors; one set normally open and one set normally closed. Where additional contactors are required for Automatic Interface or Temperature Control, it shall be the ATC Subcontractor’s responsibility. Interface shall be provided for all starters and other devices as noted herein.

F. Starters and contactors factory-built into the control panel of packaged equipment will be considered as an integral part of the package.

G. All starters, disconnects and control devices shall be clearly labeled with black lamacoid plates with engraved white letters, to indicate Owner’s identification number, function and the equipment which they control. Submit list of labels for review.

2.26 Fluid Treatment and Chemical Cleaning

A. The HVAC Subcontractor shall engage the services of a reputable water treatment Subcontractor, such as New England Systems and Supply, Inc., Barclay Chemical, Mogul or equal to provide a complete fluid treatment service, designed to minimize corrosion and scale formation in the piping system.

1. All necessary mechanical equipment, cleaning chemicals, treatment chemicals, control equipment and services shall be provided by a single water treatment consulting firm for individual responsibility. A one year contract for each system shall be made to cover the supply of chemical treatment and service. The fluid treatment supplier shall receive written notice prior to temporary or permanent start-up of any system requiring chemical treatment system. Make-up water piping shall conform to the Board of Health and all Town, State and Federal Code requirements.

2. The fluid treatment supplier shall forward within 90 days from job acceptance, the following for approval to the Owner:

HVAC
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   a. Product information sheets on each component, device, pump, controller, valve, etc., being supplied in the system.
   b. Analysis of Raw Water supplying each system.
   c. Product information sheets on all chemical products being supplied for each system, including cleaning chemicals.
   d. Recommended feed rates on each chemical product.
   e. Recommended operating conditions for each system, including cycles of concentration, chemical test limits and limits of water treatment system set points.
   f. Chemical Cleaning

B. Piping systems shall be thoroughly flushed out of cutting oils and other loose extraneous materials. This shall include piping installed now and capped for future use. The cleaning chemicals shall be added by the HVAC Subcontractor. The chemical supplier shall instruct as to the proper feed rates, shall check that the cleaning solution is actually in each system, shall instruct the HVAC Subcontractor as to when to flush the systems and shall check each system following flushing to insure all cleaning chemicals have been removed from each system. The HVAC Subcontractor shall block open all modulating valves, zone valves and all other system restrictions. If building pumps are not available, this Subcontractor shall provide portable pumps to circulate water for cleaning purposes.
   1. Chemical used for cleaning of system shall comply with the recommendations of the manufacturers of the major components in the system.
   2. A certificate of cleaning shall be provided by the cleaning chemical supplier to the Owner. The supplier shall supervise the cleaning.
   3. Cleaning chemicals for the water piping systems shall be an industrial cleaner equivalent to Dearborn BC-45 cleaner, Able Engineering 3X cleaner, Barclay Chemical “Liquid Flush-Out Compound” or equal. Systems shall be circulated for at least 48 hours and then thoroughly flushed so that remaining total alkalinity shall not exceed 200 ppm and maximum flushing time shall be 24 hours. Supervision of the cleaning process shall be by the Water Treatment Subcontractor. Cleaning solution shall not remain in systems longer than the 48 hours noted. Provide cleaning and addition of chemical listed in item C. below as each phase of the project is accepted and a complete full system cleaning and addition of chemical listed in item C. at the completion of the final phase.
   4. Closed Systems:
   C. The systems shall each have a 5 gallon capacity Shot Feeder installed as shown on the Drawings. The system shall be thoroughly flushed and cleaned with Dearborn BC-45 Cleaner and charged with Dearborn B-239 Nitrate Corrosion Inhibitor, Able Engineering CT-650, Barclay Chemical Inhibitor N-101, or equal after cleaning. Control limits of 800 to 1000 ppm shall be maintained.
      1. The feeders shall have:
      2. Inlet opening [3/4” NPT]
a. Outlet opening [34" NPT]
   b. Bottom drain with drain valve
   c. Mounting bracket
   d. Top opening for chemical addition [2” minimum]
   e. Pressure test as required
   f. Install feeders in a two valve bypass arrangement around the most convenient circulating pump. 3/4" NPT feeder lean-in line shall be taken from the circulating line on the discharge side of the pump. 3/4" NPT feeder outlet line shall run to the circulating line on the suction side of the pump.
   g. The HVAC Subcontractor shall notify the Water Treatment Subcontractor prior to the operation of any Water System so that they can be initially charged with chemical.

D. Consulting Analysis Services:

E. Provide installation, cleaning, start-up supervision and training of Maintenance Personnel.

   1. Provide written instructions, dosage rates, control limits, and a complete supply of test kits, reagents and test materials.
   2. Provide a minimum of 4 quarterly Consulting Analysis Service Visits with written reports and recommendations submitted. Provide a one year supply of all chemicals from date of initial start-up.

2.27 Access Panels

A. All work shall be installed such that all parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of magnitude shall not be made without written approval from the Designer.

B. Furnish access panels for installation in walls and ceilings at locations indicated on drawings or as required to permit access for adjustment, removal or replacement and servicing of all equipment such as splitter and balancing dampers, VAV boxes, reheat coils and all other items requiring maintenance and adjustment.

C. Access doors shall be installed under other appropriate sections for the surface or construction upon which the panels are located. This shall be coordinated with the Designer and denoted on the Coordination Drawings.

D. All access panels and doors shall be located in closets, storage rooms and/or other non-public areas, in a workmanlike manner, positioned such that the junction can be easily reached and the size shall be sufficient for this purpose [minimum 18 inches by 18 inches]. When the access doors are required in corridors, lobbies or other areas, they shall be located as directed by the Designer.

E. This Subcontractor shall inform the applicable section Contractor where access is required through ceilings in order that special clips for access can be provided.
F. Access panels and doors shall be 2, 3 or 4 hour rated as required to maintain rating of surface are installed in.

2.28 Circuit Balancing Valve

A. All balancing valves 3/4" through 2" shall be accusetter combination ball valve and Venturi flow measuring section as manufactured by Flow Design, Inc., Preso Meters Corp., Tour and Anderson [Victaulic] or approved equal.

B. Each unit shall be one piece, non ferrous bronze/brass flow measuring and balancing/shut off valve combination with a low less/high signal Venturi that has an accuracy of +2% with a one to ten rangeability. Venturi to be fitted with dual pressure/temperature ports including retained safety caps.

C. Balancing/Shut off valves shall be ball type with large diameter plated ball, teflon seats, blow out proof stem with teflon packing and packing nut. Full size handle, grip and memory stop. Entire assembly rated to 400 WOG and tested to 100 lbs. after assembly.

D. Furnish to job site a portable differential pressure gauge rated for 500 psi/185 with a body of brass or stainless steel, diaphragm to be of beryllium copper or 316 stainless steel, seals will be of nitrile rubber and a dial face of 6" with an arc of 270. Dial case will be aluminum with ABS bezel. The meter kit shall be supplied complete, mounted in a resistant carrying-case, including Hi and Low purge valves, 2 hoses with finger tight quick connections, charts and operating instructions. The gauge shall be selected to be capable of reading the flows within a range of 20% - 80% of full scale. A second gauge shall be furnished, if necessary to meet this criteria.

E. Gauge shall become property of the Owner upon completion of the balancing.

229 – CONDENSING HOT WATER BOILER

1. MANDATORY COMPLIANCE:

A. Boilers shall be Listed by the Massachusetts Gas Regulatory Board and shall have been Certified in accordance with ANSI Z21.13a-2005 - American National Standard/CSA Standard for Gas-Fired Low Pressure Steam and Hot Water Boilers; ANSI Z223.1 (NFPA 54) for Gas-Fired Boilers; ANSI/ASME CSD-1 and National Electrical Code (NFPA 70).

B. Commercial Boiler Efficiency Certification Program AHRI Directory of Certified AHRI Certified™ Ratings list of Boilers that have earned the AHRI Certified mark.

C. 522 CMR 4.00 Steam and Hot Water Boilers and Heat Storage Sources; 522 CMR 5.00 Heating Boilers; 522 CMR 16.00 Controls and Safety Devices for Automatically Fired Boilers; 248 CMR 7.00 Fuel Gas Code for Gas Utilization Equipment in Large Boilers.

D. Commonwealth of Massachusetts State Building Code, 780 CMR 1305.2.5 Heating System Controls; and Table 1305.3.3(5) Standard Rating Conditions and Minimum Performance Gas and Oil fired Steam and Hot Water Boilers.
E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

2. APPROVAL CRITERIA:

A. Boilers shall meet or exceed scheduled I=B=R Capacities and Ratings and will be held to strict compliance with these Contract Specifications and Ratings. Boiler shall meet or exceed scheduled I=B=R Capacities and Ratings and will be held to strict compliance with these Contract Documents. Non-I=B=R/AHRI Certified Boilers shall not be considered acceptable.

B. To be considered acceptable, any Boiler manufacturer shall have achieved third-party verification and obtained Certification of their performance ratings as administered by AHRI (Air Conditioning, Heating and Refrigeration Institute) under the GAMA/I=B=R testing procedures, and shall be listed in the AHRI Directory of Certified Product Performance lists. Boiler manufacturer shall be required to provide the Certified Reference Number and Approved Status under the previously specified performance criteria at Submittal stage. This Certification number shall be utilized in the Rebate application to National Grid confirming the installation of an “Approved” appliance.

C. GAMA/I=B=R Efficiency Rating and Certification programs that test and certify the performance Commercial water heating equipment shall be designed to meet the Federal guidelines for third party certification programs. Testing to ANSI Z21.13 CSA or UL is not equivalent and shall not be acceptable third party Performance Efficiency Certification. Boiler shall produce less than 50 dB sound reading at 100% rate of fire.

D. Boiler shall also be safety certified and listed by C.S.A. International under the latest edition of the harmonized ANSI Z21.13 test standard for the U.S. and Canada and shall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1 Standard. Boiler shall be AHRI Certified to 94% Thermal Efficiency, with Oxides of Nitrogen (NOx) less than 20 ppm corrected to 3% O₂.

E. Installing Contractor shall obtain from the Boiler Manufacturer a completed [by the Boiler manufacturer] Form H-3 Manufacturers Data Report for Watertube Boilers as required by the Provisions of the ASME Code Rules, Section IV and shall transmit to the Owner after Boiler installation for Record Purposes.

F. It shall be the responsibility of the Installing Contractor to deliver ASME H-3 Forms, O&M manuals, together with complete wiring and piping diagrams, to the Owner/User and to obtain a receipt for the instructions. Written notification specifying the Name, Address, Telephone Number and available service program of Boiler Service Group as specified.

G. Installing Contractor shall include, as part of his Contract, all charges and costs for Boiler and Burner testing, start-up, checkout, adjusting, field and State inspections, including service contracts for systems and equipment as here-in-after specified. Provide signed documentation to the Awarding
Authority for completion of specified procedures.

H. Contractor shall obtain certificate of boiler inspection after boiler installation has been completed and pay all fees associated with such inspection. After receipt of certificate of inspection, Installing Contractor shall furnish a suitable glass front frame in which to place said certificate. Frame, with Inspection certificate inserted therein, shall then be placed on or posted in a suitable location within the Boiler room in which the new Boilers have been installed.

3. ELECTRICAL COORDINATION: (Coordinate with the Electrical Contractor to provide the following):

A. All Boiler room wiring from the main disconnect switch panel to the Boiler control panel, Boiler Circulator, Limit circuit, Operating controls, gas valves and actuators, switches and additional control devices shall be furnished and installed under this section of the work by the HVAC Subcontractor and shall conform to the job standards as established by Division 16000.

B. Boiler Control circuit shall be taken from a two-wire branch circuit, one side grounded, not exceeding 150 Volts, line to line. All safety control switching shall be accomplished in the hot ungrounded conductor and through the 24V low voltage wiring provided by the Boiler manufacturer and in accordance with the manufacturers instructions and recommendations.

C. Control system wiring shall comply with ASME CSD-1 requirements and 522 CMR 5.07. (19). An electrical thermal switch fused to break the ungrounded conductor in the main circuit at 165°F. Shall be installed in the main power line within six feet over the top of the Boiler. If the ceiling above the Boiler exceeds 12 Ft. In height, an additional thermal switch shall be installed on the ceiling and series connected with the lower switch. Fuse protection for the control circuit shall be provided. A manually operated remote heating plant shutdown switch shall be furnished and installed just outside the Boiler room door and shall be marked for easy identification. If there is more than one (1) Boiler room door, there shall be a switch located at each door. Shutdown switches must be wired to disconnect all power to the Boiler controls.

D. All wiring for the Boiler and Burner shall be rated for the Maximum operating temperature to which it may be exposed. All wiring between components shall have copper conductors not less than 18 AWG and constructed in accordance with the NEC/NFPA 70. All field installed romex, conduit, junction boxes and the like shall be installed so as not to interfere with the Boiler manufacturers recommended cleaning and maintenance procedures.

4. BOILER:

A. Acceptable Manufacturers:

Triangle Tube
5. CATEGORY IV SEALED COMBUSTION BOILER:

A. Furnish and install packaged modulating, sealed combustion, sealed combustion, power-vented, high efficiency gas-fired boiler(s) with cast aluminum heat exchangers that use outside air for combustion

B. Install packaged boiler unit(s) according to manufacturer's installation instructions. All work to be done in a neat and workmanlike manner.

C. Boilers shall be 92.8% minimum DOE efficient as required by National Energy Conservation Act or ASHRAE 90.1.

D. Boiler shall be capable of full modulation firing with a turn down of up to 5 to 1

E. Boiler Construction

1. Boiler(s) heat exchanger:
   Cast aluminum mono block heat exchanger.

2. Boiler(s) main components:
   The combustion chamber will be sealed and located at the top of the mono block casting which will be of counterflow design, to assure that sediment and any lime that might form will fall to the bottom, away from the crown sheet area.

3. Boiler(s) shall be supplied with a gas valve designed with negative pressure regulation (fan suction “pulls” gas through valve rather than gas pressure “pushing” gas through valve). This enables the boiler to operate in a safe condition at a derated output, even if the inlet gas pressure should drop to as low as 4 inches W.C. The inlet natural gas pressure to the boiler gas valve should be a minimum of 4" W.C. and a maximum of 13" W.C. If inlet gas pressure exceeds 13" W.C., a 100% lock-up type gas pressure regulator of adequate size must be installed in gas supply piping and adjusted to prevent pressure in excess of 13" W.C.

4. The burner shall be premix combustion type, made with stainless steel and a woven metal fiber outer covering providing a wide range of modulating firing rates.

5. The boiler shall be equipped with a variable speed blower system, capable of modulating the boiler firing rate.
6. The boiler shall be equipped with a device capable of controlling the air/fuel ratio through a 5 to 1 turndown ratio.

7. The control system shall have an electronic display for boiler set-up, boiler status, and boiler diagnostics.

B. Venting and Combustion Air
   1. Boiler(s) must be capable of using outside air piped directly to boiler for combustion. Inlet and termination of these pipes must be connected to either, through the roof or sidewall terminations as recommended by the manufacturer.
   2. The boiler shall be direct vent using Schedule 40 PVC, ABS or CPVC.

C. Boiler Trim
   1. All electrical components to be high quality manufacture and bear UL label.
   2. Water boiler(s) controls furnished:
      (a) High limit temperature control (190 degrees F maximum allowable boiler water temperature).
      (b) Combination pressure-temperature gauge. Gauge dial clearly marked and easy to read.
      (c) ASME certified pressure relief valve, set to relieve at 30 PSIG.
      (d) Flue gas, outlet water temperature, and return water temperature sensors.
      (e) Low water protection.
      (f) Built-in freeze protection.
      (g) 0014 Taco circulator.

D. Boiler Manuals
   1. The boiler(s) shall be provided with complete instruction manuals, including:
      (a) Boiler Installation Manual.
      (b) User's Manual.

E. COMPENSATED WATER RESET/DHW BOILER CONTROL SYSTEM:
   1. Micro-Processor type electronic microprocessor based boiler control system with ability to operate the system pump and provide outdoor reset operation and domestic how water or setpoint operation with priority. Control shall provide modulation output for each boiler adjusted from a 0 to 10 VDC signal, shall include minimum & maximum modulation settings and comprise a boiler sequencer capable of sequential or parallel modulation with equal run time rotation of the Boilers. Control shall also control the individual Boiler circulators.
   2. NEMA 250 Type 1 enclosure with cover, equal to Tekmar 275. Control shall be equipped with sensors to monitor Outside Air temperature, Supply
Water temperature, DHW sensor, and shall directly control the Boiler modulation to maintain Target water temperature.

3. Provide LED Display to visually indicate control status, display system temperatures, DHW temperature, settings and menus. Wiring chamber and terminals; Outdoor Air temperature Sensor; Heat Starter for Warm Weather shutdown, and System supply water temperature sensor. Furnish and install Class II 24 Volt Transformer.

7. INSTALLATION REQUIREMENTS:

A. Substitution of equipment by the Installing Contractor which is to be wired, piped or welded shall detail and include any additional changes involved for work or wiring over and above that required for the equipment specified. The approval of substitution of equipment does not relieve the Installing Contractor from the responsibility for any valid charges for additional work which may have to be performed by other trades as a result of any substitution.

B. Fabricate base and attachment to pressure vessel with reinforcement strong enough to resist boiler movement during a seismic event when boiler base is anchored to building structure.

C. An initial Hydrostatic pressure test of 50 PSI shall be conducted on each Boiler for a period of not less than 5 hours. Tests shall be of such duration as necessary to ensure that the Boiler has been installed and piped correctly with no leaks or other improper operating conditions.

D. All field tests after the Boiler has been installed and connected to the system shall be limited to not more than 50 PSI. Installing Contractor shall furnish all equipment, piping, labor, staging, fittings, valves, hoses and other materials and shall pay all required permits for Inspection as may be required to flush the system and the Boilers, and to perform such tests as may be directed by these Contract Documents and as required by the Owners Insurance Underwriters and the State Boiler Inspector.

8. COMMISSIONING:

A. Installing Contractor shall supervise all phases of Boiler installation, pressure testing, startup, follow up service and training of operating personnel. Installing Contractor shall also provide all installation verification inspections, system functional and safety operational tests, and heating system capacity verification tests.

B. The Boiler manufacturers Representative shall provide the start up, final adjusting and testing of the Boiler and controls in the presence of the Consulting Engineer, ATC/DDC start up representative and the Owners operating personnel. State Gas inspector, and gas company representative shall also be in attendance when applicable. Boiler manufacturers representative shall also provide training on the Boilers and Controls and in boiler care and maintenance to Owners Operating HVAC

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Personnel.

C. Coordination: Installing Contractor shall be responsible for coordinating all equipment and specified personnel necessary for start-up, adjustment, and testing. Provide minimum seven (7) days notice to all parties.

D. General: Initial start-up, testing and adjustment shall comply with all applicable Local and State Regulations and requirements. Start up and final adjustment shall be in accordance with the Boiler manufacturer’s start-up instructions. Test and adjust Boiler for maximum efficiency. Test and adjust combustion controls, boiler controls and boiler cascade controls for proper operation and maximum system efficiency. Replace damaged or malfunctioning controls and equipment in accordance with the manufacturers warranty requirements.

E. Boiler shall be started and adjusted utilizing instruments to verify that the boiler is operating within acceptable tolerances of the factory fire test report. Copies of a written report of the start-up, including the factors of the factory fire test and the factors of the start-up, shall be furnished to the Engineer.

F. Installing Contractor shall guarantee the entire installation for a period of One (1) Year from the date of Owner Acceptance and beneficial usage by the Owner and Date of Final Payment.

2.30 FIN TUBE RADIATION AND ENCLOSURE

A. Capacities for radiation shall be based on average water temperatures, as indicated in the drawings.

B. Provide sliding saddle hangers in two pieces to allow expansion of the element within the enclosure.

C. Provide gasket at the rear of each wall-mounted unit.

D. Enclosure shall be 14 gauge bonderized steel with prime coat finish. Provide floor supports at each end and at a maximum of three feet on center for pedestal radiation. No surface overlaps shall be permitted on any enclosure. All corners and bends shall be at right angle construction.

E. Radiation element and enclosures shall be provided by the HVAC Subcontractor.

F. Types, sizes and capacities and active element lengths shall be as shown on the drawings.

G. Enclosure shall be wall-to-wall, column-to-column, or completely free standing, as shown on the Drawings, and shall be manufactured to suit the details shown on the Drawings. Do not penetrate wall vapor barrier. Wall-to-wall and column-to-column enclosure shall be provided with end caps and corner pieces. Provide with piano hinge flush access doors with tamperproof cam lock operated by Allen wrench at each end to service valves where valves are located in enclosures.
H. Fin tube radiation and enclosure shall be by the same manufacturer. Provide all baffles and hanger hardware for custom-enclosed and furred in radiation.
PART 3 - EXECUTION

3.01 Operation and Start-Up

A. This Subcontractor shall furnish all labor, materials and equipment necessary to place the equipment into operation and then start and operate all systems to demonstrate the fitness of the installation.

B. Prior to start-up, this Subcontractor shall check all equipment for rotation, check belts for tightness, provide lubrication, clean all equipment, perform pressure tests and make all other adjustments necessary for start-up.

3.02 Coordination

A. The structure and its appurtenances, clearances and the related services, such as plumbing, heating, ventilating and electric service, have been planned to be adequate and suitable for the installation of equipment specified under this Section. The Owner will not assume any increase in cost caused by differing requirements peculiar to a particular make or type of equipment and any such incidental cost shall be borne by this Subcontractor. He shall be responsible for the proper installation and location of his required sleeves, chases, inserts, etc., and see that they are set in the forms before the concrete is poured. He shall be responsible for his work and equipment furnished and installed by him until the completion and final acceptance of this contract, and he shall replace any work which may be damaged, lost or stolen, without additional cost to the Owner.

B. In the event there is conflict or inadequate space for the proper installation of HVAC equipment, this Subcontractor shall prepare a scaled (1/4" = 1'0" minimum) composite sketch, showing the building structure and all equipment and items affecting the installation, to clearly identify the areas of conflict. This Subcontractor shall submit four (4) copies of the sketch, along with a written explanation of the problem, to the Designer for his review and determination on what action to take to resolve the conflict.

C. It shall be the duty of this Subcontractor to furnish full information to all trades relative to the work they are to do in connection with work under this Section. This includes data for wiring, including wiring diagrams, equipment foundations, pipe connections, etc., furnished under other Sections.

3.03 Valve Tags and System Identification

A. Refer to Paragraph 15500 1.25 - IDENTIFICATION OF MECHANICAL SERVICES

3.04 Cutting, Patching and Core Drilling

A. Refer to SECTION 01045 CUTTING AND PATCHING.

B. Provide notification in time to other trades of openings required for Mechanical Work. Supply accurate details of location and size. When this requirement is not met, bear the cost of cutting and patching and core drilling.

C. Patching required for the installation of the HVAC work shall be provided by the Applicable Sections Contractor, not by the HVAC Subcontractor. All drilling and cutting required for the installation of drilling and cutting required for the installation of the HVAC work shall be performed by the Applicable Sections Contractor, not by the HVAC Subcontractor.

D. Obtain written approval of the Designer before cutting any openings through structural HVAC.
3.05 Connections To Equipment

A. Provide unions or flanges at all connections to equipment. Ensure that piping adjacent to equipment is readily removable for servicing and/or removal of equipment, without shutting down the entire system.

B. Install unions in piping up to and including 2-inch pipe size. Install flanges in piping 2 1/2 inch pipe size and larger.

C. Prevent galvanic corrosion by isolating copper and steel. Use bronze-bodies valves, or completely isolate flanges using full face gaskets with bolts installed through phenolic sleeves with insulating fiber washers.

3.06 Provisions For Pipe Expansion

A. Make provision for pipe expansion and contraction with suitable anchors and offsets or expansion loops.

B. Install piping to allow freedom of movement in all planes without imposing undue stress on any section of the main piping, branch piping, equipment and structure.

C. Use offsets at takeoffs to radiation, unit heaters, risers and other branch lines.

D. Select expansion joints for the calculated movement according to the following temperature ranges:

1. For cold pipes, from minimum operating temperature to 100 degrees F., plus 25% safety factor.

2. For warm and hot pipes, from minimum ambient, but not higher than 0 degrees F., to maximum operating temperature plus 25% safety factor.

3. When ambient temperature during installation is higher than operating temperatures, use precompressed expansion joints.

4. Expansion joints shall be selected to withstand system test pressure, as well as operating pressures and temperatures.

5. Install expansion joints in accordance with manufacturer's published installation instructions.

6. Refer to Drawings for operating temperature of system.

E. Where shown on the Drawings, and where space limitations do not permit the use of expansion loops or offsets, use Expansion Joints according to the following schedule:

1. For piping up to and including 2 1/2 inches, select ends to suit specified pipe fittings. Pressure shall be external to the bellows:

   a. Steel Piping - Expansion Compensators with two-ply stainless steel bellows. Use on other than fin tube radiation.

   b. Copper Piping - Expansion Compensator with two-ply bellows, all bronze construction.
2. For piping 3 inches and above, use flanged ends.
   a. Steel Piping - Flexing Expansion joint, with stainless steel pressure carrier, flanged ends.
   b. Copper Piping - Flexible Expansion Joint, with Monel pressure carrier, and brass flanged ends.

3. Refer to Drawings for additional details.

3.07 Pipe Guides and Anchors

A. Provide pipe guides for expansion joints according to expansion joint manufacturer’s published recommendations. Use at least two guides each side of expansion joint or expansion loops.

B. Install manufacturer or field fabricated alignment guides to allow movement in axial direction only. Install vertical risers properly anchored and guided to maintain accurate vertical position of piping. At time of start-up, clean and lubricate guides, and adjust to allow free sliding at operating conditions.

C. For piping up to and including three [3] inches, guide pipes at every floor or every thirteen feet. Guide larger pipes at every second floor or every twenty-five feet.

D. Fabricate anchors from structural steel channels, plates or angles secured to the structure.

E. Take care to avoid introduction of excessive reactive forces and operating weights into the structure and onto equipment and piping.

F. Provide thermal break on guides and anchors used for cold piping.

G. Prepare and submit for review, prior to installation, drawings showing the location of expansion joints and anchors. Show details of proposed connection to structure.

H. Prior to installation, the magnitude of reactive forces and operating weights on the structure shall be approved.

3.08 Inserts

A. Properly locate and firmly secure inserts to form before concrete is poured.

B. For support of light equipment and materials, approved self-drilled expansion shields may be used.

C. Where inserts must be placed after concrete has been poured, use self-drilled expansion shield inserts.

D. Place inserts only within main structure and not in any finishing materials.

E. When inserts are required in precast concrete, supply inserts and location drawings to the precast concrete supplier for casting into the material. Otherwise, include the cost of having the precast concrete supplier install inserts at the site.

F. Use wedge type concrete inserts, similar to Grinnell Fig. 281, for duct, pipe and equipment.
hangers, supports and anchors, adequately sized for loads to be carried.

G. If inserts cannot be placed in formwork, use self-drilling Red Head expansion shield inserts in the new construction areas as approved by the Structural Engineer.

3.09 Hangers

A. Suspend piping, ductwork and equipment with all necessary hangers and supports required for a safe and workmanlike installation. Ensure that pipes are free to expand and contract and are graded properly, and that each hanger is adjusted to take its full share of the weight.

B. Suspend hanger rods directly from the structure. Do not suspend rods from pipes, ducts, equipment, metal work or ceilings.

C. Furnish and install auxiliary structural steel angles, channels and beams where ductwork, piping and equipment must be suspended between joists or beams.

D. Hangers shall be spaced to ensure that structural steel members are not overstressed. In no case shall pipe hangers be further apart than indicated in the tables. When requested, submit detailed drawings showing locations and magnitude of ductwork, piping and equipment loads on the structure.

E. The use of trapeze-type hangers for support of piping shall be subject to prior acceptance. Where permitted, fabricate from angle or channel frames and space hangers to suit the smallest pipe size.

F. Do not use hooks, chains or straps to support equipment, piping or materials.

G. For precast concrete work, if inserts cannot be cast into members, pass hanger rods between the members and weld to steel plate resting on the upper surface of the precast interval. To prevent raising of the hanger rod, apply a lock nut and two [2] inches minimum diameter slot washer tight against the upper surface of the precast material.

H. Ensure that copper materials are completely isolated from ferrous materials. Use either plastic coated hangers and clamps, or use lead inserts between copper piping and ferrous materials and between copper piping and copper-coated ferrous materials.

I. All hangers shall have provision for adjustment. Hangers and rods in equipment rooms shall have a prime coat of rust inhibitive paint or cadmium coating.

J. Use round steel threaded rods, which shall conform to ASTM Spec. A-36. Sizes shall be not less than the sizes shown in the tables.

K. The following tables establish minimum standards of rod sizes and hanger spacing.

1. For steel piping refer to the following table:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Maximum Horizontal Spacing of Supports - Feet</th>
<th>Rod Size - Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>5</td>
<td>3/8</td>
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<tr>
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<td>6</td>
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<td>3/8</td>
</tr>
<tr>
<td>1-1/2</td>
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<td>3/8</td>
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<table>
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<tr>
<th>Pipe Size</th>
<th>Maximum Horizontal Spacing of Supports - Feet</th>
<th>Rod Size - Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-0</td>
<td>10</td>
<td>3/8</td>
</tr>
<tr>
<td>2-1/2</td>
<td>11</td>
<td>1/2</td>
</tr>
<tr>
<td>3-0</td>
<td>12</td>
<td>1/2</td>
</tr>
<tr>
<td>4-0</td>
<td>14</td>
<td>5/8</td>
</tr>
<tr>
<td>5-0</td>
<td>16</td>
<td>5/8</td>
</tr>
</tbody>
</table>

2. For copper pipes, refer to the following table:

<table>
<thead>
<tr>
<th>Pipe Size</th>
<th>Maximum Horizontal Spacing of Supports - Feet</th>
<th>Rod Size - Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>5</td>
<td>3/8</td>
</tr>
<tr>
<td>3/4</td>
<td>6</td>
<td>3/8</td>
</tr>
<tr>
<td>1-0</td>
<td>6</td>
<td>3/8</td>
</tr>
<tr>
<td>1-1/4</td>
<td>7</td>
<td>3/8</td>
</tr>
<tr>
<td>1-1/2</td>
<td>8</td>
<td>3/8</td>
</tr>
<tr>
<td>2-0</td>
<td>9</td>
<td>3/8</td>
</tr>
<tr>
<td>2-1/2</td>
<td>10</td>
<td>1/2</td>
</tr>
<tr>
<td>3-0</td>
<td>10</td>
<td>1/2</td>
</tr>
<tr>
<td>4-0</td>
<td>12</td>
<td>5/8</td>
</tr>
<tr>
<td>5-0</td>
<td>13</td>
<td>3/4</td>
</tr>
</tbody>
</table>

L. In addition to these basic requirements, furnish and install hangers in the following locations:

1. Where required to eliminate vibration. Refer to applicable articles of the Specifications under SOUND AND VIBRATION CONTROL including Item 15500 - 2.24 N and O.
2. At points of vertical and horizontal change in direction of pipe.
3. At valves and strainers.
4. On piping mains at branch takeoffs.
5. Where required to avoid stress on equipment connections.

M. Refer to applicable articles of the Specifications regarding thermal insulation requirements. Unless shown specifically on Drawing Details, conform to the following methods of support:

1. For insulated warm [up to 210 degrees F.] and uninsulated piping, attach hangers directly to the piping, except as noted for roll hangers provide protection shields to prevent crushing of insulation.
2. For domestic cold water, chilled water, chilled/glycol, condenser water, heat pump where insulated, steam piping, hot water piping above 210°F and refrigerant piping,
hangers shall be large enough to fit over specified pipe covering. At each point of support, use galvanized insulation protection shields, similar to Grinnell Fig. 167, with sufficient length to prevent crushing of insulation.

N. Install spring hangers or other special supports as specified in applicable articles of Sound and Vibration Control.

O. Ductwork shall be supported as per SMACNA guidelines.

P. Support vertical duct risers at each floor with rolled angle collars bearing on building structure.

Q. Provide specified inserts or Grinnell Fig. 229 or 292 beam clamps which shall have extended collars such that hanger rod can be removed in future without disturbing fireproofing over beam flange. Clamp the rod assembly at beam.

R. Do not use inserts in existing buildings unless approved by the structural engineer. All equipment sheetmetal and piping must be supported from existing beam flanges with beam clamps or supplemental steel as approved by the structural engineer.

S. Pipe riser clamps shall be similar to Grinnell Fig. 261 for steel piping, and similar to Grinnell Fig. 261C - 121C [plastic coated] for copper piping. Set clamps on adequately sized bearing plates.

T. For other types of piping, such as plastic transits, or those which have mechanical joints or fused or packed joints, supports shall be selected and spaced according to the pipe manufacturer’s published recommendations or be supported continuously, if necessary, to prevent sagging.

U. Standard pipe hangers shall be similar to:

<table>
<thead>
<tr>
<th>Piping Material</th>
<th>Finished Installation or Bare Pipe Size</th>
<th>Hangers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>to 3”</td>
<td>Grinnell Fig. 269 adjustable wrought iron</td>
</tr>
<tr>
<td>Steel</td>
<td>4” up to 6”</td>
<td>Grinnell Fig. 260 adjustable wrought clevis</td>
</tr>
<tr>
<td>Copper</td>
<td>to 4”</td>
<td>Grinnell Fig. CT-99C [plastic adjustable wrought ring]</td>
</tr>
</tbody>
</table>

V. For steel piping 8” and larger suspended from above, use single pipe rolls similar to Grinnell 171. For piping supported from below, use adjustable pipe rolls, similar to Grinnell Fig. 271. In conjunction with roll type supports, use protection saddles similar to Grinnell Fig. 160, and Fig. 167 for insulation protection.

W. Conform to applicable items within 15500 - 2.42 SOUND AND VIBRATION CONTROL.

X. All hanger rods installed in pipe tunnels or areas with less than 7’0” from bottom of hanger rod to floor shall have rods cut back to eliminate protruding rod ends. Cut off ends of existing rods.

3.10 Wiring
A. Where wiring is to be provided under SECTION 15500 - including 2.48 AUTOMATIC TEMPERATURE CONTROLS, it shall conform to the requirements of SECTION 16100, ELECTRICAL of the Specifications.

B. Install wiring materials parallel and perpendicular to building planes. Install materials parallel to building planes. Install as per SECTION 16100 of the Specifications.

C. Conduit and wiring materials shall be provided in strict accordance with the requirements of SECTION 16100, ELECTRICAL.

3.11 Painting

A. Supply ferrous metal work, except piping and galvanized steel ductwork, with at least one factory prime coat, or paint one prime coat on job.

B. Clean and steel brush surfaces of welds. Then prime coat all steel supports and brackets.

C. On uninsulated piping, steel brush and prime coat welds.

D. Touch-up or repaint all surfaces damaged during shipment or installation and prepare surface for finish painting.

E. Paint with flat black, all surfaces visible behind air diffusers and grilles. This shall include surfaces behind grilles provided by others to which sheetmetal connects.

F. The Painting Contractor shall paint all mechanical equipment, enclosures, covers, panels, ducts, insulation, conduit and other equipment exposed to view, except factory finished items. Care shall be taken not to paint over equipment nameplates. This Contractor shall leave surfaces to be painted ready to receive paint. The Painting Contractor shall apply paint in accordance with the Painting and Finishing portion of the Specifications. Colors shall be selected by the Architect.

G. Prime coat material shall conform to SECTION 09900 - PAINTING of this Specification.

H. Finish painting will be carried out by SECTION 09900 - PAINTING of this Specification.

3.12 Sleeves, Wall Plates and Floor Plates

A. Set sleeves for piping and ductwork in conjunction with erection of floors and walls. Locate sleeves accurately and in accordance with Shop Drawings. Comply with 15500 - 2.42 H and O.

B. Size sleeves to provide 1 inch clearance around piping and ductwork, and to allow continuous runs of insulation where specified. Ensure that piping and ductwork do not touch sleeves.

C. Pack clearance spaces with Thermalfibre Firestopping. Caulk, ProSet System, U.S. Gypsum or equal with fire resistant, resilient waterproof compound, Flintguard 120-13, ProSet System, U.S. Gypsum or equal. Ensure that fire ratings of floors and walls are maintained.

D. Piping sleeves shall be according to the following:

1. Through interior walls, use 18 gauge rolled and tack welded galvanized steel sleeves, set flush with finished surfaces on both sides. Refer to Room Finish Schedule.
2. Through exterior walls above grade and roofs, use machine cut and reamed standard weight steel piping, set flush with finished surfaces on inside and to suit flashing on outside.

3. For floors in mechanical equipment rooms, and similar areas where a water dam is required, use machine cut and reamed standard weight steel piping set flush to underside of structure and extending 6 inches above finished floor.

4. For other floors, use 18 gauge rolled and tack welded galvanized steel, or standard weight steel piping set flush to both finished surfaces. Refer to Room Finish Schedule.

5. Refer to drawing details for sleeving through below grade walls.

6. Cover pipe sleeves in walls and ceilings of finished areas other than equipment rooms with satin finish stainless steel, or satin finish chrome or nickel plated brass escutcheons, with non-ferrous set screws. Do not use stamped steel split plates. Split cast plates with screw locks may be used.

E. Duct sleeves shall be minimum 18 gauge galvanized steel. Provide adequate bracing for support of sleeves during concrete and masonry work. For fire rated floors and walls, build fire dampers into structure to attain fire rated construction, in a manner acceptable to the Local and State Authorities.

F. Cover exposed duct sleeves in finished areas with 18 gauge galvanized steel plates in the form of duct collars. Fix in position with non-ferrous metal screws.

G. Prepare and submit detailed drawings showing accurate size and spacing of sleeves. Submit for review at least four weeks before installation.

3.13 Flashing and Curbs

A. Curbs, except pre-manufactured roof curbs, required for Section 15500 work and shown on the Structural or Architectural Drawings, will be provided under SECTION 07531. Pre-manufactured curbs furnished under Section 15500 shall be installed by the Roof Subcontractor under SECTION 07531.

B. Other curbs required for Section 15500 work, including reinforcing steel, will be provided by others at the expense of SECTION 15500 Subcontractor.

C. Curbs are required for roof mounted equipment, around pipes passing through roof, and surrounding holes where pipes or groups of pipes and/or ducts pass through equipment floors.

D. Roof curbs shall be minimum 18 inches height above finished roof. Refer to Drawings for specific requirements exceeding this minimum.

E. Curbs around holes in equipment room floors shall be concrete or steel, extending at least 6 inches above finished floor. Provide watertight connection between curb and floor.

F. Fill spaces between curbs and pipes and ducts with thermafiber firestopping. Caulk with fire resistant waterproofing compound, Flintguard 120-13, ProSet System, U.S. Gypsum or equal, to provide watertight connection.

G. Flashing will be carried out under Roofing Contract for roof curbs shown on the Architectural or Structural Drawings.
H. Provide flashing for pipe openings or pre-manufactured roof curbs.

I. Carry out all counterflashing for pipes and ducts passing through roof. Fit counterflashing over flashing or curb. Pitch pockets are not acceptable.

3.14 Concrete

A. Concrete work required for Section 15500 work and shown on the Structural or Architectural Drawings, will be carried out under SECTION 03300 - CAST-IN-PLACE CONCRETE.

B. Other concrete work required for Section 15500 work, including reinforcing steel, and concrete required for inertia pad bases, will be carried out under SECTION 03300, at the expense of the HVAC Subcontractor in accordance with Section 03300.

C. Supply and set in position floating reinforced concrete inertia bases, which are specified under Sound and Vibration Controls.

3.15 Lintels

A. Supply all reinforcing steel or structural steel required over openings required solely by HVAC Subcontractor and not shown on Architectural or Structural Drawings.

B. Ensure that openings are formed in accordance with Architectural and Structural requirements before installation of mechanical work.

3.16 Steel

A. Steel required for Section 15500 work, and not shown on Structural or Architectural Drawings, shall be supplied and installed by the HVAC Subcontractor.

B. Steel shall have adequate strength to support equipment and materials during testing and under all operating conditions.

C. Support suspended equipment from the bottom or from manufacturer's designated suspension points. Tanks and similar equipment with adequate beam strength shall be supported by saddles with curvature to match exactly the equipment. Other equipment shall be supported continuously.

D. Steel supports exposed to weather or in contact with water or humidity conditions shall be either galvanized after fabrication or fabricated from materials having approved corrosion resistance. Brush welds clean and apply two prime coats of rust inhibiting paint.

E. Refer to SOUND AND VIBRATION CONTROL - 15500 Item 2.42 of the Specifications. Mechanical Trade shall insure that equipment is sufficiently rigid for point supported by specified isolators. Provide auxiliary structural steel supports if required.

3.17 System Balancing and Testing of Equipment

A. Before operation of any piece of HVAC equipment and prior to initial occupancy of the building, completely balance all air, water and control systems to conform to specified quantities and to the intent of the design of the mechanical system. The building shall not be deemed ready for occupancy and a certificate of occupancy will not be issued without the initial Balancing Report submitted to and approved by the Designer.
B. Work shall be performed by a fully qualified and experienced System Balancing Subcontractor. The Subcontractor shall be named in the shop drawing submission together with a summary of his qualifications. The Subcontractor shall spend full time on the job supervising and directing the work listed below.

C. Obtain, pay for, and supply to the technician, a complete set of HVAC Drawings. Supply to the Balancing Subcontractor certified performance data for all equipment.

D. For specified test opening, refer to 15500, 2.01 SHEETMETAL. Provide additional opening required for pitot tube traverses. Openings shall be closed using removable gasketed plugs.

E. Air balances shall be initiated by accurate fan capacity tests including for each fan system, a pitot tube traverse, static pressures across the fan, fan BHP and RPM. Cross check each set of readings with manufacturer’s fan curves. Take into account condition of filters and, if necessary, adjust fan speed to suit system design requirements. Following this, the required number of distribution air balances shall be carried out, and adjustments made in order to obtain required terminal air flows with ± 5%. At least one additional fan capacity test shall be carried out as described above, after the distribution balance has been carried out. All air systems shall be balanced with outside air dampers in their normal minimum position. Test all modes of operation.

F. Where similar or typical conditions exist, submit for review, simplified checking procedures for portions of the balancing work. These procedures may be accepted if proposed procedures do not decrease the quality of the air balance.

G. Water balance shall be initiated by checking each pump BHP, and suction and discharge pressures, and pressure drops across rated equipment [e.g. chillers, unit heaters, coils, etc.]. Where necessary to obtain design flows, impeller diameters will be altered. Water distribution shall be checked and adjusted to all equipment by means of measuring air on and off conditions at coils and for water temperature change entering and leaving coils. Procedure shall be governed by good practice and field conditions in order to obtain design flows within ± 5%.

H. Control balance shall be initiated by checking, calibrating and recording the operating and sensitivity of ALL controls under all operating conditions.

I. Check and record air and water supply temperatures at source and at end of each system. Check and record each unit discharge air temperature with thermostat set midpoint, maximum and minimum. Correct deficiencies and record results. This procedure shall be carried out with system on all cycles.

J. Check safety controls and record control sequence. Check freezestats using ice water. Check flow switches to ensure proper interlocking of equipment.

K. Air temperature on and off coils shall be checked and recorded on 3’ x 3’ grid at not less than three different supply water temperatures or flow quantities. Water temperatures entering and leaving coils and where practicable, pressure drops shall be recorded.

L. Scheduled air and water control, and changeover controls shall be checked and operation recorded by simulating complete operating cycle.

M. After all systems have been balanced satisfactorily, mark final positions of dampers and valves. Submit a report in triplicate for checking, along with one copy of the requested balances required to obtain final results. This report shall contain the following:

HVAC
23 0000 - 50
1. Suction and discharge pressure gauge readings and water flow [GPM] for each pump.

2. Pump curve for each pump showing plotted design conditions, and field conditions.

3. Water on and off temperature at each major piece of equipment such as boilers, chillers, towers and coils.

4. Detailed summary of velocity traverses and calculated air quantities for each fan, fan coil units and fans.

5. Fan curve for each fan showing plotted design and field conditions.

6. Static pressure readings across filter banks, coil banks of each air handling system, showing design and actual readings.

7. Measured suction, discharge and total static pressure for each fan using pitot tube measurement.

8. Summary showing design and actual CFM from each low pressure outlet, complete with description of the method used to obtain same.

9. Outside air, on and off coils, and terminal air supply temperature for each air handling system and all unit ventilators.

10. Rated and actual motor current, in amperes, of every motor at full load conditions.

11. Schematics for all systems with all outlets numbered or “marked-up” sepia with some information.

12. When directed, make capacity test of equipment. Tests for heating and cooling shall be made at different times of the year.

13. Complete report on smoke exhaust system operation and any system, connected to emergency power, verifying that they perform as per design.

14. All minimum outdoor air quantities shall be verified in conjunction with the ATC Subcontractor to ensure minimums [fresh air minimum flow takes priority] are attained in all air handling systems.

N. As part of this contract the HVAC Subcontractor shall make any changes in belts, pulley, damper and add any dampers required to provide a completely balanced system, at no expense to the Owner.

O. The HVAC Subcontractor shall carry out not less than the following pressure tests on piping systems and shall perform these tests in the presence of the Owner.

1. Bring systems up to maximum operating temperatures and test at pressure as per ASME code.

2. Carry out tests required by the authorities having jurisdiction.

3. If tests are required by an authority having jurisdiction, tests shall be made in the presence of each governing authority’s authorized inspector and certified by that person.

4. Tests not required by the authorities shall be certified by the installing contractor.

HVAC
23 0000 - 51
5. Perform tests before piping is covered or before piping or ductwork is concealed. Test ductwork as per SMACNA recommendations.

6. Remove all components which will not withstand test pressure and replace after tests.

7. Eliminate leaks, or remove and refit defective parts. Caulking of threaded or welded joints will not be permitted.

8. Repeat tests as often as necessary to obtain certification.

9. Pressure test oil piping with compressed air, not water.

P. Perform operational tests on all motor driven equipment and run continuously for at least 40 hours. Notify the Owner and Engineer before test. Correct defects in noise, vibration, misalignment and in balance.

Q. Refer to 15500 2.01 Sheetmetal Dampers. Review all sheetmetal fabrication shop drawings prior to fabrication as noted therein.

R. Comply with applicable items in 15500 2.42 Note Item 15500 2.42 D.

3.18 Completion

A. Run-in all bearings and gear boxes. Follow manufacturer's written instructions. After running-in, flush out and refill with recommended lubricants.

B. Remove oil and dirt from equipment surfaces and bases.

C. Check and align all drives. Adjust belts for proper tension.

D. Clean all fixtures and equipment.

E. Check and align all pumps to manufacturer’s acceptable tolerances.

F. Remove all temporary protection and covers.

G. Vacuum clean the inside of all air handling systems when the systems are 99% complete, including fans, ducts, coils, and terminal units to ensure that they are free from debris and dust. Coordinate with General Contractor and Designer.

H. Drain, flush for a minimum of 24 hours and refill piping systems as often as required to ensure clean piping systems. This work shall be performed to the satisfaction of the Designer.

I. Change air and water filters, as witnessed by the Owner’s representative and Designer before the Owner accepts the building.

J. Remove, clean and reinstall pipeline strainer screens in the presence of the Owner’s representative and Designer. Obtain proof in writing of final cleaning. Obtain a full fluid treatment report on all of the hydronic systems.

K. Leave mechanical work in as new working order.

L. Refer to SECTION 01700 - CONTRACT CLOSE-OUT
3.19 Instructions To The Owner

A. Submit to the Owner, lists for each system or piece of equipment indicating that all components have been checked and are complete prior to instruction period.

B. Thoroughly instruct the Owner’s authorized representative in the safe operation of the systems and equipment. This instructional procedure shall be video taped by the HVAC Subcontractor and two [2] copies shall be provided to the Owner.

C. Arrange and pay for the services of qualified manufacturer’s representatives to instruct the Owner on specialized portions of the installation. These instructional sessions shall also be video taped as per Part B. A minimum of specialized systems which shall be review are as follows:

1. Chiller plant and controls.
2. H.W. boiler plant and controls.
3. Building Automatic Temperature Control System
4. Water treatment system
5. Fans
6. Air handlers

D. Submit a complete record of instructions given to the Owner. For each instruction period, supply the following data:

1. Date
2. Duration
3. System or equipment involved
4. Names of persons giving instructions
5. Names of persons being instructed
6. Other people present

E. Instructional period shall be carried out during a continuous period of 30 days prior to the use and occupancy of the building and building mechanical systems.

F. Refer to 01700 CONTRACT CLOSE-OUT.

3.20 Inspection

A. Period inspections of the work in progress will be made to check general conformity of the work to the Drawings and Specifications.

B. Correct all deficiencies immediately upon notification.

C. Final review of the work [Punch List] shall not commence until such time as the Balancing Report and “snap shots” of the ATC points in both the “occupied” and “unoccupied” modes of operation are received in an approved form and the HVAC System is operational.
including the control system operating on automatic.

3.21 Testing

A. Furnish all labor, materials, instruments, supplies and services and bear all costs for the accomplishment of the tests herein specified. Correct all defects appearing under tests and repeat the tests until all defects are disclosed. Leave equipment clean and ready for use.

B. Perform all tests other than herein specified which may be required by Legal Authorities or by Agencies to whose requirements this work is to conform.

C. Furnish all necessary testing apparatus, make all temporary connections and perform all testing operations required, at no additional cost to the Owner.

D. All equipment and ductwork installed under this Contract shall be tested and found tight. Insulated or otherwise concealed piping shall be tested before being closed-in. All leaking joints shall be corrected, retested and found tight. Such tests shall conform to the requirements of local codes but shall not be less than the equivalent of the tests called for herein.

E. Tests performed shall not relieve the HVAC Subcontractor of his responsibility if leaks develop after the tests are made.

3.22 Final Inspection

A. When all HVAC work in this project has been completed as indicated on the Drawings and specified herein and is ready for final inspection, such an inspection shall be made by the Designer's and the Owner's Representatives. At this time the HVAC Subcontractor for the work under this Section shall demonstrate that the requirements of these specifications and Drawings, have been met to the satisfaction of the Designer and the Owner. All submittals shall be required prior to the final inspection.

END OF SECTION
SECTION 26 00 00
ELECTRICAL

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS
A. Include the General Conditions of the Contract and Division 1, General Requirements, as part of this Section.
B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.
C. Coordinate work of this Section with that of all other trades affecting, or affected by, this Section. Cooperate with such trades to assure the steady progress of all work under the contract.

1.2 SCOPE OF WORK
A. The scope of work consists of the installation of all materials to be furnished under this Section, and without limiting the generality thereof, includes all equipment, labor and services required for the furnishing, delivering, and installing the principal items of work hereinafter and all items incidental thereto as specified herein and as shown on the drawings.
B. The itemization of work hereinafter specified does not in any way limit the responsibility to perform all work and furnish all the equipment, labor, and materials necessary for completion and satisfaction of operation of the installations described in the Specifications and shown on the Contract Drawings. In addition to the principal and miscellaneous items of work specifically mentioned and/or indicated, to be responsible for furnishing and installing all incidental and collateral materials such as supporting hardware for panelboards, conduit hangers, fastening devices, insulating tape and the like, which constitute essential components of the grade of Electrical Trade Practices and Workmanship acceptable to the Architect.

1. Electrical distribution system and associated metering equipment.
2. Feeders and service entrance conductors.
3. Installation and wiring of motor starters.
5. Telephone system wiring and associated raceways.
6. Cable television distribution system wiring and associated raceways.
7. Installation and wiring of magnetic starters.
8. Dwelling unit chime system.
9. Carbon monoxide system.
10. Dwelling unit smoke detectors and combination smoke/carbon monoxide detectors.
11. Panelboards and dwelling unit load centers.
12. Secondary electric service.
13. Cable television system service conduits.
14. Cable television system wiring.
15. Telephone system service conduits.
16. Telephone system wiring.
17. Nameplates and labels.
18. Disconnect switches.
20. Motor wiring.
21. Site lighting fixtures.
22. Lighting fixtures and associated branch circuit wiring.
23. Fire alarm system.
24. Wiring devices and device plates.
26. Central Station fire alarm services.
27. Municipal digitize panel.
28. Backcharges by the Newton Fire Department to test the building fire alarm systems.
29. Fire alarm system test and UL certification by independent testing company and associated cost to perform the same.

1.3 RELATED WORK

A. The following work is not included in this Section and is to be performed under the designated Sections:

1. All temperature control wiring shall be furnished and installed by the HVAC Contractor (Section 230000).
2. Charges for current consumed by the temporary light and power system for construction will be paid by the General Contractor.
3. Painting (except for factory finished items) specified under Section APainting@.
4. Access panels, where required, are furnished under Section 083100, but shall be installed under the related trades of the surface in which they are installed.
5. Mechanical system starters furnished under Section 230000 installed and wired by the Electrical Contractor.
6. Backcharges for secondary electric service, telephone service, and cable television system shall be borne by the Owner.
7. Plywood backboards for the building telephone and data systems as indicated on the Drawings shall be shall be performed under Section 060000.
8. Temporary electric service shall be installed under Section 260000 and shall meet the requirements of Section 015000 Temporary Facilities and Controls.

1.4 BREAKDOWN

A. This Contractor must submit a breakdown of his contract price to aid the Architect in determining the value of work installed as the job progresses.

B. No requisition will be paid to this Contractor until after the breakdown is delivered to the Architect.
C. Breakdown shall consist of, not less than the following items. The figure for each item shall include costs of material, labor, markup, and all other costs applicable to the item.

1. Raceway installation.
2. Wires and cables.
3. Main electric service and service entrance conductors, cable television system service, and telephone system service.
4. Main electric disconnect switch, metering equipment, panelboards, and associated feeders.
5. Motor wiring.
7. Fire alarm systems
8. Telephone system, associated wiring and telephone outlets.
9. Cable television, associated wiring and CATV outlets.
10. Lighting fixtures and associated branch circuit wiring.
12. Site lighting and associated branch circuit wiring.
13. Municipal digitize panel.

1.5 SUBMITTALS
A. Submit complete Product Data Sheets in accordance with the provisions of the GENERAL CONDITIONS AND SECTION 01300 SUBMITTALS.
B. Data sheets shall include, but are not necessarily limited to, the following items:

1. Main disconnect switch and associated electrical metering equipment.
2. Panelboards.
3. Wiring devices.
4. Wiring device plates.
5. Lighting fixtures.
7. Ballasts.
8. Lamps.
9. Special support equipment.
10. Outlet boxes and junction box.
11. Conduit.
12. Electrical distribution equipment.
13. Emergency batteries and emergency lighting fixtures.
14. Fire alarm system equipment.
15. Anchoring systems.
17. Panelboard, junction box and terminal box nameplates.
18. Wiring devices.
19. Telephone system cables and associated outlets.
20. Cable television system cables and associated outlets.

C. In addition to product data sheets and shop drawings the Electrical Contractor shall submit the following information in sextuplicate:
2. Operating and maintenance manuals.
3. Panelboard directories.
4. Equipment inventory and nameplate rating of all mechanical and electrical equipment.

1.6 REFERENCES
A. Installation shall comply in all details with the Massachusetts Electrical Code with its latest revisions and all prevailing local, Federal and State regulations.
B. Material and equipment shall be Underwriters' laboratories, Inc., listed, where a standard has been established.
C. Manufacturers' names and nomenclature facilitates descriptions of certain materials and equipment and are used to establish type, quality and function.
D. Unless otherwise specified, all work shall be manufactured, tested and installed in accordance with the latest editions of applicable publications and standards of the following organizations:
2. Underwriters' Laboratories, Inc. (U.L.)
3. Insulated Power Cable Engineers Association (IPCEA).
5. Institute of Electrical and Electronic Engineers (IEEE).
E. Should specifications, Architects' instructions, laws, ordinances or public authority require any special tests or approvals, arrange for these and give the Architect timely notice. If the inspection is by another authority other than the Architect, notify the Architect of the dates fixed for such inspection.
F. Make all reasonable tests required by the Architect to provide the integrity of the electrical installation and leave the entire installation properly adjusted and in operating condition. After connections are made test the insulation resistance of all parts of the electrical work except that which is not furnished under this Specification. All wiring shall be so installed that when completed the system will be free from short circuits and from unintentional grounds.
G. Where reference is made to Codes and Standards these shall be interpreted as minimum requirements. Requirements in excess of these codes and Standards may be indicated on the Drawings or in the Specifications and shall be so included in the contract work. Compliance with such code requirements only shall not be construed as fulfillment of the contract work,
where the plans and/or Specifications indicate additional work, which may exceed such code standards.

H. Copies of NEMA, NFPA, and NEC shall be made available by the Electrical Contractor at the job site.

1.7 SAMPLES
A. Submit samples of all materials requested by the Architect.
B. Examples shall be prepared and submitted in accordance with the requirements of GENERAL CONDITIONS AND SECTION 01300 SUBMITTALS with all postage and transportation costs paid by the Contractor.

1.8 RECORD DRAWINGS
A. In accordance with requirements, furnish and keep in the job at all times, two (2) complete and separate sets of blackline prints of the electrical work on which shall be clearly, neatly and accurately noted, promptly as the work progresses, all electrical changes, revisions and additions to the work. Wherever work is installed otherwise than as shown on the Contract Drawings, such changes shall be noted.
B. Indicate daily progress on these prints by coloring in the various conduit, fixtures, apparatus and associated appurtenances as they are erected.
C. No approval of requisition for payment for work installed will be given unless supported by record prints as required above.
D. At the conclusion of work, prepare Record Drawings in accordance with General Conditions.

1.9 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS
A. Instruct to the Owner's satisfaction such persons as the Owner designates, in the proper operation and maintenance of the systems and their parts. The contractor shall provide on site instruction of each building electrical system.
B. Furnish operating and maintenance manuals and forward same to the Architect for transmittal to the Owner.
C. Operating instructions shall be specific for each system and shall include copies of posted specific instructions.
D. For maintenance purposes, provide Shop Drawings, parts lists, specifications, and manufacturer's maintenance bulletins for each piece of equipment.
E. Provide name, address and telephone number of the manufacturer's representative and service company, for each piece of equipment so that service or spare parts can be readily obtained.
F. Provide copies of the panelboard directories for review by the owner before installing directories in the panelboard.

1.10 GUARANTEE
A. Attention is directed to provisions of the GENERAL CONDITIONS regarding guarantees and warranties for work under this Contract.
B. Manufacturers shall provide their standard guarantee for work under this Section. However, such guarantees shall be in addition to and not in lieu of all other liabilities, which the manufacturer and Contractor may have by law or by other provisions of the Contract Documents.
C. All material, items of equipment and workmanship furnished under this Section shall carry for this standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship or design, which may develop, shall be made good, forthwith, by and at the expense of the Electrical Contractor, including all other damage done to areas, materials and other systems resulting from this failure.

D. Electrical Contractor shall guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.

E. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the guarantee period, the affected part or parts shall be replaced by the Electrical Contractor.

F. Furnish, before the final payment is made, a written guarantee covering the above requirements.

G. Lamps shall be furnished and installed in each lighting fixture as soon as fixtures are properly hung. Replace all lamps that fail within ninety (90) days after final acceptance at no additional cost. If the Electrical Contractor fails to replace lamps during the guarantee period, after a second request the Owner may replace lamps and back-charge Electrical Contractor.

1.11 WORKMANSHIP

A. The entire work provided in this Specification shall be constructed and finished in every respect in a workmanlike and substantial manner. It is not intended that the Drawings shall show every pipe, fitting and appliance, but Electrical Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice and the satisfaction of the Architect.

B. Keep other Subcontractors fully informed as to shape, size and position of all openings required for apparatus and give full information to the Contractor and other Subcontractors sufficiently in advance of the work so that all openings may be built in advance. Furnish and install all sleeves, supports, etc., hereinafter specified or required.

C. In the case of failure on the part of Electrical Contractor to give proper and timely information as noted above, the Electrical Contractor shall do his own cutting and patching without extra expense to the Owner.

D. Obtain detailed information from the manufacturers of apparatus as to the proper method of installing and connecting same. Obtain all information from the Electrical Contractor and other Subcontractors, which may be necessary to facilitate work and the completion of the whole project.

E. Remove daily, all rubbish and debris and all refuse from workmen's lunches and at completion remove all his surplus materials, and leave the work in clean condition acceptable to the Architect.

1.12 PROTECTION

A. The Electrical Contractor shall be responsible for his work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

B. The Electrical Contractor shall protect work and materials of other trades from damage that might be caused by his work or workmen and make good damage thus caused.

1.13 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

A. Before submitting prices or beginning work, thoroughly make an examination of the site and the contract documents. The Electrical Contractor shall visit the premises before submitting his
proposal and make how own appraisal of the difficulties and conditions that will be encountered during the work. No additional charges will be allowed for work required due to existing conditions to make the installation conform to the specifications and the general arrangement shown on the drawings.

B. No claim for extra compensation will be recognized if difficulties are encountered, which an examination of site conditions and contract documents prior to executing contract would have revealed.

C. The drawings showing layout of the electrical systems indicated the approximate location of existing outlets and equipment. THE OUTLETS, AS SHOWN ON THE DRAWINGS, ARE NOT INTENDED TO SHOW THE ROUTING OF THE WIRE; THE FINAL DETERMINATION AS TO THE ROUTING SHALL BE GOVERNED BY FIELD CONDITIONS.

D. The right to make any reasonable change in the location of outlets, apparatus, and equipment up to the time of installation is reserved by the Architect without involving any additional expense to the Owner.

E. Be responsible for all materials delivered to the site in connection with the work and pay all charges for cartage, scaffolds, planking, rigging, and erecting. Take every precaution necessary to protect equipment and installation in addition to plugging and protecting open ends of all pipes, outlet boxes, panelboxes, and junction boxes. All equipment shall be stored in a clean dry place to preserve the quality of materials being used. Equipment and/or materials damaged during construction shall be replaced at no additional cost to the Owner.

F. All materials and equipment required by this Specification shall be new, clean and free from defects at the time of installation. The Manufacturers' and Underwriters' label shall appear on all material and equipment unless otherwise approved, in writing, by the Owner.

1.14 TEMPORARY FACILITIES

A. The Electrical Contractor shall furnish all tools, equipment, and temporary construction required for the execution of the electrical work.

B. All temporary construction shall be rigidly built in accordance with all local and State requirements, and shall be removed from the premises upon completion of the work.

C. Any other temporary construction required for the electrical work shall be provided by the Electrical Contractor, but shall be located as directed by the Architect.

1.15 SUBSTITUTION OF MATERIALS OR EQUIPMENT

A. If the Electrical Contractor wishes to use materials or equipment other than those specifically designated herein, as being equal to those so specifically designated: BEFORE PURCHASING AND/OR FABRICATION, he shall submit the proposed substitution in accordance with the requirements of Sections 01600 and 01631, and the decision of whether or not it is equal to that specified shall be determined by the Architect.

B. If the apparatus or materials substituted for those specified necessitate changes or additional connections, piping supports, construction of work of other sections: same shall be provided and the Electrical Contractor shall assume the cost and the entire responsibility therefor.

C. The Architect's permission to make such substitution shall not relieve the Electrical Contractor from full responsibility for the work.

1.16 DRAWINGS

A. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, ducts, conduits, piping and fixtures. The locations
of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions, are approximate only. The exact locations necessary to secure the best conditions and results must be determined at the project being installed. The Electrical Contractor shall follow Drawings in laying out work and shall check Drawings of other trades to verify space conditions at all points where headroom and space conditions appear inadequate. Architect shall be notified before proceeding with the installation. The Electrical Contractor shall, without extra cost, make reasonable modifications in the layout as needed to prevent conflict with the work of other trades or existing conditions for proper execution of work.

1.17 PROCEDURE
A. The Electrical Contractor shall give his personal superintendence to the work, keeping also a competent foreman constantly on the grounds. The Electrical Contractor shall be responsible for all his property stored on the premises and shall hold the Owner free from liability for loss by theft or carelessness of employees of the Owner or of other Subcontractors. The Electrical Contractor must take particular care to protect any finished work from injury or defacement; and must remedy at his own expense, any injury caused thereto by his operation. After completion of the work, the Electrical Contractor shall remove all waste, rubbish and other materials left as a result of his operation and leave the premises in clean condition.

1.18 FIELD MEASUREMENTS
A. The Electrical Contractor shall verify, in the field, all measurements necessary for his work and shall assume responsibility for their accuracy.

1.19 PERMITS, LAWS, ORDINANCES & CODES
A. The Electrical Contractor shall give all necessary notices, obtain all permits, and pay all taxes, fees and other costs in connection with his work; file all necessary plans, prepare all necessary documents and obtain all necessary approvals of state authorities, all local, town, city, or county departments having jurisdiction; obtain all required certificates of inspection for his work.
B. The Electrical Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings in addition to Contract Drawings and Documents, in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on the drawings and/or specified.
C. All materials furnished and all work installed shall comply with the rules and recommendations of the Massachusetts Electrical Code, the National Board of Fire Underwriters', all requirements of the local utility company, recommendations from the fire insurance rating organizations having jurisdiction, and with the requirements of all local, town, city, or county departments having jurisdiction.

1.20 DEFINITIONS
A. "Furnish and Install" means to supply, erect, install and connect up, complete for regular operation, the particular item referred to, unless otherwise specified. "Piping" includes, in addition to pipe, all fittings, boxes, hangers and other accessories relating to such piping. "Concealed" means hidden from sight as in trenches, chases, furred spaces, shafts, hung ceilings, embedded into construction, ground or concealed as defined above.

1.21 DAMAGE TO OTHER WORK
A. Each Contractor shall be held responsible for and shall pay for all damage to other work caused by his work or workmen.
B. Repairing of such damage shall be done by the General Contractor or Contractors who installed the work, and so directed by the Architect.

1.22 VISIT TO PREMISES
A. This Contractor shall visit the premises before submitting his proposal and make his own appraisal of the difficulties and conditions that will be encountered during the work. No additional charges will be allowed for work required due to existing conditions to make the installation conform to the specifications and the general arrangement shown on the Drawings.

1.23 SUPERINTENDENCE OF WORK
A. This Subcontractor shall give his personal superintendence to the work and shall retain at the job site during the period of construction, a competent foreman, satisfactory to the Architect, who shall be in full charge or the work under this Section.

1.24 CLEANING UP
A. This Subcontractor shall, at the completion of the work, clean all exposed items of material, equipment and fixtures in his Contract so as to leave such items bright and clean. Special attention being given to interiors and exteriors of all panels, electrical equipment, and enclosures.

B. All painted metal surfaces which have been scratched, dented or marred shall be repainted by this Subcontractor.

C. After completion of the work, this Subcontractor shall remove all waste, rubbish and other materials left as a result of his operation and leave the premises in clean condition.

1.25 CONFLICT BETWEEN PLANS AND SPECIFICATION
A. In case of conflict between contract plans and the specifications the Architect will decide which takes precedence.

1.26 STORAGE OF MATERIALS
A. The Electrical Subcontractor shall store his material and equipment prior to installation only where designated by the Architect. He shall be responsible for all his property stored on the premises and shall hold the Owner free from liability for loss by theft.

B. The Electrical Subcontractor shall take particular care to protect any finished work from injury or defacement and must remedy, at his expense, any injury caused thereto by his operations.

PART 2: PRODUCTS

2.1 PULL BOXES, WIREWAYS AND CHANNELS
A. Pull boxes shall be code gauge galvanized steel with screw covers to match. Pull boxes and wireways shall be as shown on Drawings and/or as required by NEC and/or job conditions, with steel barriers separating systems.

B. Wireways shall be code gauge galvanized steel, manufactured standard sections and fittings, with combination hinged and screw covers.

C. Steel channel supports shall be minimum 1-5/8 inch mold strip steel with minimum .105 inch wall thickness, Unistrut P1000, Kindorf, Husky Products, or equal.
2.2 RACEWAYS

A. Rigid metal conduit shall be hot-dipped galvanized steel conforming to UL Standard No. 1242. Conduit shall be as manufactured by Republic Steel Corp., Pyle National, Allied Tube and Conduit Corp., or equal.

B. Electric metallic tubing shall be hot-dipped steel conforming to UL Standard No. 747. Tubing shall be as manufactured by Pyle National, Allied Tube and Conduit Corp., Wheatland Tube Company or equal.

C. Flexible metal conduit shall be galvanized steel with separate copper grounding conductor. Liquid-tight flexible metal conduit shall be similar, but with extruded moisture and oilproof outer jacket of polyvinyl chloride plastic.

D. Couplings and connectors for electrical metallic tubing shall be galvanized steel set-screw.

E. Steel support rods or support bolts for conduits shall be 1/8" diameter galvanized steel for each inch or fraction thereof of diameter of conduit size, but no rod or bolt shall be less than 1/4" in diameter.

F. Conduit ends shall be cut square, threaded and reamed to remove burrs and sharp edges. Field threads shall be of the same type and have the same effective length as factory cut threads. Excessive exposed threads will not be allowed. Turns, wherever required in exposed conduit runs shall be made by the use of factory-made bends, (or field-made bends, as approved). Condulets, or in the event of a multiplicity of conduits making the same turn, a steel junction box with a removable steel cover may be used. Offsets and bends for changes in elevation of exposed conduit runs shall be made at walls or beams and not in open spaces between walls or beams. Conduits shall be routed so as not to interfere with the operation or maintenance of any equipment. The entire job shall be done in a neat and workmanlike manner, as approved by the Architect. Steel racks shall be galvanized steel channel and fittings, Unistrut, Kindorf, Husky Products Company, or equal.

G. Conduits or surface metal raceways shall be routed in the field so as to be coordinated with the building structure. Exposed conduit shall be run in straight lines parallel to walls, beams and columns and with right angle bends and threaded conduit fittings.

H. The number of conductors indicated within each branch circuit conduit on the Drawings is not indicated. For 20 ampere branch circuit wiring furnish and install the number of individual conduits required to limit the number of conductors in each conduit to a number which will not require derating to a value below 100 percent of the current rating of the circuit overcurrent protective device indicated on the Drawings.

2.3 WIRE AND CABLE

A. Wiring shall be minimum of #12 AWG solid, except fire alarm system wiring which will meet the requirements of the fire alarm system manufacturer.

B. Provide single conductor wire and cable with 600V insulation of sizes shown on Drawings. Wire size #8 AWG and larger shall be stranded. Wire of size smaller than #8 AWG shall be solid. Conductors shall be soft drawn copper with conductivity of not less than 98% of ANSI Standard for annealed copper.

C. Wire and cable shall be Type THWN-THHN building wire, 600V, rated for 75 degrees C. in wet locations and 90 degrees C. in dry locations.

D. Wire and cable shall be as manufactured by Southwire, Pirelli or Essex Wire & Cable Co.
2.4 NON-METALLIC SHEATHED CABLE:
   A. For all non-metallic sheathed cable branch circuits as called for elsewhere in these
      specifications and noted on the plans furnish and install the indicated sizes of non-metallic
      sheathed cable copper type "NM" with thermoplastic insulation and jacket and ground wire as
      manufactured by the Rome Cable Company, Phelps Dodge or Newton Insulated Wire & Cable
      Co. The cable shall be approved for the type of service and installation conditions noted. Cable
      shall be supported every 4-1/2 feet by suitable type straps approved for the purpose.

2.5 LIGHT SWITCHES
   A. All local wall switches shall be of the flush tumbler type, ivory, single-pole, double-pole, 3-way or
      4-way as required, as manufactured by Pass & Seymour, Hubbell or Arrow-Hart.
   B. Local switches shall be installed in such a position that they shall bear evenly and true and be
      secured on the axis of the supporting members.
   C. Under no circumstances are wooden wedges, shims or blocks to be used in truing up local
      switches. Should the outlet box, in any case, come too far back of the finished surface, recess
      boxes and screws of the proper length to reach the box shall be used of such a size as to form a
      shoulder at exactly the proper point to retain the switch in position.
   D. Dwelling unit single-pole switches shall be Pass & Seymour CSB115-I, Leviton CSB115-I, or
      Hubbell CS115I.
   E. Dwelling unit three-way switches shall be Pass & Seymour CSB315-I, Leviton CSB315-I or
      Hubbell CS315I.
   F. Dwelling unit four-way switches shall be Pass & Seymour CSB415-I, Leviton CSB415-I or
      Hubbell CS1224I.
   G. Public area single pole switches shall be Pass & Seymour CSB120B1, Leviton CSB120-I or
      Hubbell CS120I.
   H. Public area three-way switches shall be Pass & Seymour CSB320-I, Leviton CSB320-I or
      Hubbell CS320I.
   I. Public area four-way switches shall be Pass & Seymour CSB420-I, Leviton CSB420-I or Hubbell
      CS1224I.

2.6 RECEPTACLES
   A. All convenience outlets shall be of the single or duplex type, back or side-wired. T-slot or
      polarized slot type, grounded as required, as manufactured by Pass & Seymour, Hubbell, or
      Arrow-Hart. Convenience receptacles in the dwelling units shall be tamperproof devices.
   B. In general, convenience outlet circuits shall be independent of light circuits and shall not be
      controlled by light circuit breaker switches or light switches.
   C. Duplex receptacles shall be tamper resistant Leviton T5320WH or equal as manufactured by
      Pass & Seymour, or Hubbell.
   D. Single duplex receptacle shall a tamper resistant and shall be installed on a 20-ampere branch
      circuit shall be Leviton TBR20-WH or equal as manufactured by Pass & Seymour, or Hubbell.
   E. Receptacles for dryer shall be Pass & Seymour 3864, Leviton 278, or Hubbell 9430A.
   F. Ground fault receptacles shall be Pass & Seymour 2091-I, Leviton 8599, or Hubbell GF5362I.
   G. Receptacles for electric ranges shall be Pass & Seymour 3894, Leviton 279, or Hubbell
      HBL8450A.
2.7 WIRING DEVICE PLATES:
   A. All device plates shall be smooth ivory nylon "6" construction. Plates shall be of appropriate type and size for all wiring and control devices, signal and telephone outlets. The contractor shall be responsible for the removal and disposal of existing dryer pigtauls.
   B. Plates shall be set so that all edges are in contact with the mounting surface. Plaster fillings will not be allowed. Multi-device locations shall have one common device plate.
   C. Telephone outlet plate shall be of a similar material and finish as wiring device plates and shall be provided with a bushed hole.
   D. Device plates shall be by the same manufacturer as devices.
   E. Plates for surface type boxes shall not overlap boxes and shall be designed for use with surface boxes.

2.8 OUTLET BOXES (PLASTIC)
   A. Furnish and install all required outlet boxes as manufactured by Union, Carlon/Lamson & Sessions or Nelco.
   B. All outlet boxes for non-metallic sheathed cable shall be plastic, and steel for use with armored cable and non-metallic sheathed cable, those for fixture furnished with a fixture stud and shall be rigidly mounted.
   C. Wall boxes shall be designed for the wiring method employed and shall be the best type for the wall construction involved.
   D. Install blank plates on all outlets boxes, in which no apparatus is installed, which do not integrally provide a cover for box.
   E. The exact location of all outlets and switches in finished rooms shall be obtained from the Owner and from the scale drawings of interior and finish. Final correct readjustments shall be made to outlets, if necessary, to give proper centering.
   F. Gang devices in all locations wherever possible.

2.9 OUTLET BOXES (PLASTIC) (FIRE RATED)
   A. Furnish and install all required outlet boxes as manufactured by Carlon/Lamson & Sessions or approved equal.
   B. All outlet boxes for non-metallic sheathed cable shall be plastic, and steel for use with armored cable, those for fixture furnished with a fixture stud and shall be rigidly mounted.
   C. Wall boxes shall be designed for the wiring method employed and shall be the best type for the wall construction involved.
   D. Install blank plates on all outlets boxes, in which no apparatus is installed, which do not integrally provide a cover for box.
   E. The exact location of all outlets and switches in finished rooms shall be obtained from the Owner and from the scale drawings of interior and finish. Final correct readjustments shall be made to outlets, if necessary, to give proper centering.
   F. Gang devices in all locations wherever possible.
2.10 OUTLET BOXES AND ACCESSORIES

A. Provide galvanized sheet steel outlet boxes for all outlets unless otherwise noted. Outlet boxes and accessories shall be as manufactured by Steel City, Appleton, Raco, or equal. Steel City catalog numbers are used for reference.

B. Fixture outlet boxes shall have 3/8" solid male fixture studs and auxiliary fixture stems shall be supported from 3/8" male fixture studs.

C. Outlet boxes and accessories shall be provided with a seal when used in concert with wiring device to provide an air tight seal. The seal shall be installed on all exterior and demising walls.

2.11 SAFETY SWITCHES

A. Furnish and install safety switches as required by plans and specifications. All safety switches shall be NEMA Heavy Duty Type HD and Underwriters' Laboratories listed. Square D Class 3110 or approved equal as manufactured by Siemens or General Electric.

B. All switches shall have switchblades, which are fully visible in the OFF position with the door open. All current-carrying parts shall be plated through electrolytic processes to resist corrosion and promote cool operation.

C. Switches shall be quick-make and quick-break such that, during normal operation of the switch, the operation of the contacts shall not capable of being restrained by the operating handle after the closing or opening action of the contacts has started. The handle and mechanism shall be an integral part of the box, not the cover, with positive padlocking provisions in the OFF position.

D. Switches shall be furnished in NEMA 1 general purpose enclosures unless NEMA 3R (raintight) in indicated on the plans. Enclosures shall be of code gauge (UL 98) sheet steel (NEMA 1) or code gauge (UL 98) galvanized steel (NEMA 3R) with a rust-inhibiting phosphate treatment and gray baked enamel finish.

E. Switches shall be horsepower rated for 600 volts ac.

2.12 PANELBOARDS

A. Panelboards shall be type "NQOD", bolted as manufactured by Square D, General Electric or Siemens Electrical Products Company.

B. The panelboard schedule indicates the details as to size, voltage, capacity and number of circuits necessary, including spares.

C. The panelboard shall conform to the requirements of the Underwriters' Label.

D. Circuit breakers 1, 2, and 3-pole for 120/208 volt application shall be type "QOB" - 10,000 amps interrupting capacity as indicated on drawings. Circuit breakers shall be bolt-on type. All locks of all panels shall be operated by a common master key.

E. Furnish and install on the inside cover of all light and power panels, a neatly typed index, giving the circuit number; and opposite each number the area of equipment which that particular circuit serves or controls.

F. In connecting branch circuits to panels, care shall be taken to insure balance; and circuit numbering shown on plans shall be changed to prevent same circuits on same phase being connected to a common neutral.
3.13 NAMEPLATES
A. Nameplates consisting of black plastic with white center, lettering to be 1/4" high, engraved through to white layer and properly fastened with brass screws shall be provided for the following equipment:
   1. All panelboards.
   2. Terminal cabinets.
   3. Junction boxes larger than 4-11/16".

3.14 APARTMENT LOAD CENTERS
A. Apartment load centers shall be located in each apartment as indicated on the drawings.
B. Load centers shall be as manufactured by Siemens, General Electric, or Square D.
C. Load centers to contain main lugs as indicated on the Drawings and "EQP" branch circuit breakers as indicated on the panel schedules.
D. Directories to be typed indicating function of each circuit and inserted under a clear plastic protective cover in all load centers.

3.15 LIGHTING FIXTURES
A. The Electrical Contractor shall assume all responsibility for the safe handling of all lighting fixtures, which are furnished under this Section and other accessories and lamps, until the final inspection has been made by the Architect.
B. Special fittings and materials that may be required to support fixtures shall be supplied as well as supports or grounds required to secure surface or pendant mounted fixtures on suspended ceilings unless otherwise noted. Fluorescent fixtures mounted in association with suspended ceiling systems shall be supported above the ceiling by threaded three eighths inch diameter continuous galvanized steel hanger rods. Each 4-foot fixture or 4-foot section shall have two (2) hanger rods per fixture. Where duct work, pipes, type of building construction materials and structural framing members provide obstructions or difficult support means, hanger rods shall be used in association with horizontal sections of steel support channels in a manner approved by the Architect. Steel support channels shall be Unistrut, Kindorf, Husky Products Co., or equal. The exact mounting height of all stem supported lighting fixtures shall be determined on the job by the Architect.
C. Ballasts for fluorescent fixtures shall be electronic type, as specified under ballast section of specification.
D. Multiple lamp ballasts shall be used whenever possible. Ballasts shall be of the high power factor type. The proper ballast shall be furnished and installed for all lighting fixtures normally designed for operation with ballasts, whether or not such ballasts are specifically itemized on the Fixture Schedule.
E. Furnish and install a complete set of new lamps for all fixtures. Lamps used during the construction period shall be removed and replaced with new lamps. Lamps shall be Phillips "TL" Series. All fluorescent lamps to be 32 watt octron or approved equal.
F. Fixtures, part or parts thereof (including lamps) determined to be defective upon completion of the electrical installation shall be replaced by the Electrical Contractor free of charge.
G. All suspended lighting fixtures shall be hung in association with approved aligner type hangers, except as otherwise noted.
H. In addition to fixture supports, surface mounted lighting fixtures shall be secured to the surface to which they mount at a minimum of two points on each 4 foot length of fixture housing or as recommended by the lighting fixture manufacturer, as approved, to prevent rotation or movement of the fixture out of its square and level position of alignment.

I. After the installation and lamping of permanent lighting fixtures, these fixtures may be used for lighting with the express consent of the Architect, and will not require relamping prior to the completion of the project except where such lamps are faulty or burned out.

2.16 ELECTRONIC BALLASTS

A. Electronic Ballasts where specified as electronic shall be Triad-Utrad Ballastar electronic type for straight or "U" lamps.

B. Ballast manufacturers shall have been producing electronic ballasts for at least 10 years with a low failure rate.

C. Ballasts shall operate at an input frequency of 60 Hz rated for 108-132 volts (120V circuit).

D. The ballasts shall operate the lamps at a frequency of 20 to 35 KHz and have no detectable flicker.

E. Ballasts that operate as a parallel circuit shall permit other lamps to continue functioning after one lamp has failed.

F. Ballasts are to have fewer than 32 components to assure safe and long operation.

G. Ballasts shall be of the high-power factor type of 90 percent or higher, sound rated "A" or better, contain no PCB and be listed by UL.

H. Ballasts shall be marked with manufacturer’s name, part number, supply voltage, sound rating, power factor, open circuit voltage, current draw for each lamp type and UL listing.

I. Ballasts shall comply with FCC and NEMA limits as to EMI or RFI and not interfere with the operation of other normal electrical equipment.

J. Ballasts shall have independent lab test reports and meet any applicable ANSI standards.

K. Ballasts shall not be affected by lamp failure and deliver normal lamp life.

L. Rapid Start ballasts shall provide for soft/stable start of rapid-start lamps and maintain cathode heat during operation.

M. Ballasts to be potted and in steel case.

N. Ballasts to be surge and transit protected to 6000 volts.

O. The operating temperature of ballasts is not to exceed 60 degrees centigrade at any point on case during normal operation.

2.17 PHOTOCELLS

A. This Contractor shall furnish and install photoelectric controls as herein described and indicated on the plans. Photoelectric controls shall be a Tork Model 2101 or approved equal as manufactured by Intermatic or Paragon.

B. The photoelectric control shall be heavy duty, specification grade, suitable for 1/2" conduit mounting.

C. On/off adjustment shall be easily done by moving a light level selector without the use of tools. Turn on shall be 1.5 to 5.5 foot-candles. Turn off shall be approximately 3 times the turn on setting. A delay of up to two minutes shall prevent false switching.
D. The photoelectric control shall have an operating temperature range of -40°F to 140°F. Power consumption shall average less than 1 watt.

E. The enclosure shall be die cast, gasketed for maximum weatherproofing.

F. The cell shall be cadmium sulphide, 1" diameter.

G. The contacts shall be single pole single throw normally closed. Snap action prevents chatter. (Fail in the on position.)

H. The photocell shall include a 5-year manufacturer's warranty.

2.18 FIRE ALARM SYSTEM

A. The Electrical Contractor shall furnish, install, and wire the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciator, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

D. The FAC and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

E. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final checkout and to ensure the system's integrity.

F. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

G. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on an NFPA Style 6 (Class A) Signaling Line Circuit (SLC).

2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).

3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z).

4. Digitized electronic signals shall employ check digits or multiple polling.

5. Alarm signals arriving at the main FAC shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.

H. Basic System Functional Operation

1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

   a. The system alarm LED shall flash.

   b. A local piezo electric signal in the control panel shall sound.

   c. A backlit 40-character LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
d. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.

e. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed and the associated system outputs (alarm

f. Notification appliances and/or relays) shall be activated.

I. Submittals

1. General:
   a. Five copies of all submittals shall be submitted to the Architect/Engineer for review.
   b. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
   c. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

2. Shop Drawings:
   a. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
   b. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
   c. Show annunciator layout, configurations, and terminations.

3. Manuals:
   a. Submit simultaneously with the shop drawings, two (2) complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
   b. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
   c. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

4. Software Modifications
   a. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
   b. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

5. Certifications:
a. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

J. Guaranty
1. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

K. Post Contract Maintenance
1. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
2. As part of the submittal, include a quote for a maintenance contract to provide all maintenance, test, and repair described below. Include also a quote of unscheduled maintenance/repair, including hourly rates for technicians trained on this equipment, and response travel costs. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.

3. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor that shall describe the protocol for preventive maintenance. The schedule shall include:
   a. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
   b. Each circuit in the fire alarm system shall be tested semiannually.
   c. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 5.

L. Post Contract Expansions
1. The contractor shall provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.

2. As part of the submittal include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal (list actual quantity of each type).

3. Quotation shall include installation and test labor and labor to reprogram the system for this 10% expansion. If additional FAC hardware would be required, include the material and labor necessary to install this hardware.

4. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FAC and at each intelligent addressable device. Do not include cost of conventional peripherals or the cost of initiating devices or Notification appliances connected to the addressable monitor/control modules.

5. Submittals that do not include this estimate of post contract expansion cost will not be accepted.
M. Applicable Standards and Specifications
   1. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards.
      a. National Fire Protection Association (NFPA) - USA:
      b. Underwriters Laboratories Inc. (UL) - USA:
         1) No. 268 Smoke Detectors for Fire Protective Signaling Systems.
         2) No. 864 Control Units for Fire Protective Signaling Systems.
         3) No. 268A Smoke Detectors for Duct Applications.
         4) No. 464 Audible Signaling Appliances.
         5) No. 38 Manually Actuated Signaling Boxes.
         6) No. 346 Waterflow Indicators for Fire Protective Signaling Systems.
      c. Local and State Building Codes.
      d. All requirements of the Authority Having Jurisdiction (AHJ).

N. Approvals
   1. The system shall have proper listing and/or approval from the following nationally recognized agencies:
      a. UL Underwriters Laboratories Inc.
      b. FM Factory Mutual
   2. The fire alarm control panel shall meet UL Standard 864, (Control Units).
   3. The system shall be listed by the national agencies as suitable for extinguishing release applications.

O. Equipment And Material, General
   1. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.
   2. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
   3. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

P. Conduit and Wire:
   1. Conduit:
      a. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
b. Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

c. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.

d. Wiring for 24-volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

e. Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FAC manufacturer.

f. Conduit shall be 3/4 inch (19.1 mm) minimum.

2. Wire:

a. All fire alarm system wiring shall be new.

b. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.

c. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

d. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).

e. Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet (254m). The system shall support up to 1,000 ft. (25.4 m) of untwisted, unshielded wire. The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.

f. All field wiring shall be completely supervised.

g. The Fire Alarm Control panel shall be capable of T-Tapping Class B (NFPA Style 4) Signaling Line Circuits (SLC's). Systems, which do not allow or have restrictions in, for example, the amount of T-Taps, length of T-taps etc., is not acceptable.

3. Terminal Boxes, Junction Boxes and Cabinets:

a. All boxes and cabinets shall be UL listed for their use and purpose.

4. Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

5. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The
Control Panel Cabinet shall be grounded securely to either a cold-water pipe or grounding rod.

Q. Main Fire Alarm Control Panel:

1. The FAC shall be Fire-Lite Alarms Model MS-9200UD and shall contain a microprocessor based Central Processing Unit (CPU) and communicator or equal as manufactured by Gamewell or Fire Control Instruments. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, annunciators and other system controlled devices.

2. System Capacity and General Operation
   a. The control panel shall provide, or be capable of expansion to 198 intelligent/addressable devices.
   b. The system shall include Form-C alarm, Form-C trouble, and Form-A supervisory relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (NFPA Style Y) programmable Notification Appliance Circuits.
   c. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
   d. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.
   e. The FAC shall provide the following features:
      1) Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
      2) System Status Reports to display or printer.
      3) Alarm Verification.
      4) Rapid Manual Station Reporting (under 2 seconds).
      5) Periodic Detector Test, conducted automatically by software.
      6) Pre-alarm for advanced fire warning.
      7) Walk Test.
   f. The FAC shall be capable of coding Notification circuits in Temporal Pattern.

3. Central Microprocessor
   a. The Microprocessor shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
   b. The Microprocessor shall contain and execute all programming for specific action to be taken if an alarm condition is detected by the system. Such programming shall be held in non-volatile programmable memory and shall not be lost if both the system primary and secondary power failure occurs.
   c. The Microprocessor Unit shall also provide a Real-Time Clock for time annotation of system displays, printer, and history file.

4. Display
a. The Display shall provide all the controls and indicators used by the system operator and may be used to program all system operational parameters.

b. The Display shall include status information and custom alphanumeric labels for all Addressable Detectors, Addressable Modules and Software zones.

c. The display shall provide a 40-character backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide 5 Light-Emitting-Diodes (LEDs) that will indicate the status of the following system parameters: AC POWER, FIRE ALARM, SYSTEM TROUBLE, ALARM SILENCED, SUPERVISORY, and PRE-ALARM.

d. The Display shall provide a 21-key touch keypad with control capability to command all system functions, entry of alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

e. The Display shall include the following operator functions: ALARM SILENCE, RESET, DRILL, and ACKNOWLEDGE.

5. Signaling Line Circuit (SLC)

a. The SLC interface shall provide power to and communicate with up to 99 addressable detectors (Ionization, Photoelectric, or Thermal) and 99 addressable modules (monitor or control) for a system capacity of 198 devices.

b. This shall be accomplished over a single SLC loop and shall be capable of NFPA 72 Style 4, Style 6, or Style 7 wiring.

6. Serial Interfaces

a. An EIA-232 interface between the Fire Alarm Control Panel and UL Listed Electronic Data Processing (EDP) peripherals shall be provided.

b. The EIA-232 interface shall allow the use of printers, CRT monitors, and PC compatible computers.

c. An EIA-485 interface shall be available for the serial connection of remote annunciators and LCD displays.

7. Enclosures:

a. The control panel shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer’s standard finish.

b. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.

8. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients, consistent with UL standard 864.

9. Optional plug-in modules shall be provided for by NFPA 72-1993 for Auxiliary and Remote Station requirements.

10. Digital Alarm Communicator Transmitter (DACT). The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

a. The DACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UD.ACT shall have the ability for remote mounting, up to 6,000 feet (1828.8 m) from the fire alarm control panel. The wire connections between the UD.ACT and the control panel shall be supervised with
one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.

b. The DACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.

c. The DACT shall be completely field programmable from a built-in keypad and 4-character red, seven segment display.

d. The DACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.

e. Communication shall include vital system status such as:
   1) Independent Zone (Alarm, trouble, non-alarm, supervisory)
   2) Independent Addressable Device Status
   3) AC (Mains) Power Loss
   4) Low Battery and Earth Fault
   5) System Off Normal
   6) 12 and 24 Hour Test Signal
   7) Abnormal Test Signal (per UL requirements)
   8) EIA-485 Communications Failure
   9) Phone Line Failure

f. The DACT shall support independent zone/point reporting when used in the Contact ID format. In this format, the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

11. Power Supply:

a. The Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FAC.

b. It shall provide 3.0 amps of usable Notification appliance power, using a switching 24 VDC regulator. A 3.0 amp Notification expansion power supply shall be available for the demanding requirements of UL 1971 and ADA devices, for a total system capacity of 6 amps.

c. It shall provide a battery charger capable of charging batteries up to 17 amp hours.

d. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.

e. It shall be power-limited per 1995 UL864 standards.

12. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24-volt power supply or used to power Notification Appliances.

a. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60-hour standby.

b. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a
relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.

c. The FCPS shall include an attractive surface mount backbox.

d. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 1993 NFPA requirements.

e. The FCPS include power limited circuitry, per 1995 UL standards.

13. Field Wiring Terminal Blocks

a. Terminal blocks shall have sufficient capacity for 18 to 12 AWG wire.

14. Operators Controls

a. Acknowledge Switch:

1) Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 40-character LCD display to the next alarm or trouble condition.

2) Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

b. Alarm Silence Switch:

1) Activation of the Signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FAC software shall include silence inhibit and auto-silence timers.

c. System Reset Switch:

1) The system reset switch shall cause all electronically latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.

2) Holding the system RESET switch shall perform a lamp test function.

15. Field Programming

a. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.

b. All programming may be accomplished through the standard FAC keypad.

c. All field-defined programs shall be stored in non-volatile memory.

d. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.

e. A special program check function shall be provided to detect common operator errors.
f. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.

g. For flexibility, an off-line programming function, with batch upload/download, shall also be available.

16. Specific System Operations

a. Alarm Verification: Each intelligent addressable smoke detector in the system shall be independently selected and enabled to be alarm verified. The alarm verification delay shall be programmable from 5 to 30 seconds. The FAC shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

b. Point Disable: Any device in the system may be enabled or disabled through the system keypad.

c. Read Status: The system shall be able to display the following status functions:

   1) Device status.
   2) Zone status.
   3) Notification appliance circuit status.
   4) System parameters.

d. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing system status.

e. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a History Buffer that will be capable of storing up to 500 system alarms/troubles/operator actions. Each of these activations will be stored and time and date stamped with the actual time of the activation.

f. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each intelligent smoke detector and shall analyze the detector responses over a period of time.

g. Software Zones: The FAC shall provide 56 software zones. All addressable devices may be field programmed to be grouped into software zones for control activation and annunciation purposes.

R. System Components:

1. Programmable Electronic Sounders:

   a. Electronic sounders shall operate on 24 VDC nominal.

   b. Electronic sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.

   c. Shall be flush or surface mounted as show on plans.

2. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

   a. The maximum pulse duration shall be 2/10 of one second.

   b. Strobe intensity shall meet the requirements of UL 1971.

   c. The flash rate shall meet the requirements of UL 1971.

3. Audible/Visual Combination Devices:

   ELECTRICAL
   26 00 00 - 25
a. Shall meet the applicable requirements of Section A listed above for audibility.
b. Shall meet the requirements of Section B listed above for visibility.

4. Addressable Devices - General

a. Addressable Devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices, which use a binary address setting method, such as a dipswitch, are not an allowable substitute.

5. Addressable Pull Box (manual station)

a. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
b. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
c. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

6. Addressable Photoelectric Smoke Detector

a. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

7. Addressable Dry Contact Monitor Module

a. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
b. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.
c. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
d. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

8. Two Wire Detector Monitor Module

a. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
b. The two-wire monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or with an optional surface backbox.
c. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

9. Addressable Control Module
a. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.

b. The control module shall mount in a standard 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box, or to a surface mounted backbox.

c. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insures that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.

d. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised, UL listed remote power supply.

e. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

10. Isolator Module

a. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

b. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

c. The isolator module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

d. The isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

11. Serially Connected Annunciator Requirements

a. The Annunciator shall communicate with the fire alarm control panel via a supervised EIA-485 communications loop and shall annunciate all zones in the system. A minimum of 32 annunciators may be connected to the EIA-485 communications loop.

b. The annunciator shall need only four wires to connect to the FAC, two for data transmission and two for 24 volt power. Annunciators, which use more than 4 wires, are not suitable substitutes.

c. The annunciator shall provide a red Alarm LED per zone, and a yellow Trouble LED per zone. The annunciator will also have an "ON-LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels.

d. Annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset.
e. The LED annunciator shall include a graphic display of the building facility.

12. **LCD Alphanumeric Display Annunciator:**
   a. The alphanumeric display annunciator shall be a supervised, backlit LCD display containing a minimum of eighty (40) characters for alarm annunciation in clear English text.
   b. The LCD annunciator shall display all alarm and trouble conditions in the system.
   c. Up to 32 LCD annunciators may be connected to a EIA 485 interface. LCD annunciators shall not reduce the annunciation or point capacity of the system. Each LCD shall include vital system wide functions such as, System Acknowledge, Silence and Reset.
   d. LCD display annunciators shall mimic the main control panel 40-character display and shall not require special programming.
   e. The LCD annunciator shall have switches for System control such as, Acknowledge, Signal Silence and System Reset. These switch inputs shall be capable of being disabled permanently or by a key lockout function on the front plate.

13. **High Intensity Exterior Strobe Light**
   a. The exterior strobe light shall be listed with Underwriter's Laboratories and accepted by the local Authority Having Jurisdiction. It shall have a minimum output of 150,000 candle power. It shall operate on 24 vdc and have a red high impact resistant polycarbonate lens. The exterior strobe shall also be of weather-resistant rain tight construction.

   Model Number: DC MAX R
   Manufacturer: Wheelock

**S. Batteries**
1. Shall be 12 volt, Gell-Cell type (two required).
2. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus ten (10) minutes of alarm upon a normal AC power failure.
3. The batteries are to be completely maintenance free.

**T. Installation**
1. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
2. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
3. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

**U. Test:**
1. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate
during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.

2. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

3. Close each sprinkler system flow valve and verify proper supervisory alarm at the FAC.

4. Verify activation of all flow switches.

5. Open initiating device circuits and verify that the trouble signal actuates.

6. Open and short signaling line circuits and verify that the trouble signal actuates.

7. Open and short Notification Appliance Circuits and verify that trouble signal actuates.

8. Ground all circuits and verify response of trouble signals.

9. Check presence and audibility of tone at all alarm notification devices.

10. Check installation, supervision, and operation of all intelligent smoke detectors using the Walk Test.

11. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FAC and the correct activation of the control points.

12. When the system is equipped with optional features, the manufacturer’s manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

V. Final Inspection:

1. At the final inspection, an authorized representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

W. Instruction:

1. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.

2. The Contractor and/or the Systems Manufacturer’s authorized representatives shall provide a typewritten "Sequence of Operation."

2.19 DIGITIZE PANELS

A. The Contractor shall furnish and install digitize Model DET-6B six zone telephone transmitters as indicated on the plans. The telegraph transmitters shall be as manufactured by Digitize Corporation of Lake Hopatcong, N. J.

1. The Digitize DET-6B is a telegraph transmitter for Fire and Security alarm use for up to 6 end of line (EOL) resistor zones and includes tamper switch, CAM lock, AC transformer, standby battery and built in charger. The unit is housed in a steel enclosure and is suitable for mounting in convenient, out of the way locations or on an interior wall.

2. Telegraph codes unique to each of the six zones for Trouble, Alarm and Secure, as well as Tamper and Low Battery are transmitted over a 100 milliampere circuit using PNIS (Positive non-interfering successive) line current detection to avoid clashes between more than one transmitting box. Automatic ground return, a watchdog timer, and a
jumper selected internal trouble buzzer assure continued main system operation and operator notification in the event of box failure. A built in trouble relay output (form C) and the ground and code relay (grounding, opening, or no effect on the 100 ma line) are activated by the watchdog timer ensuring reliable failure detection in the event of malfunction.

3. Transmission speed is adjustable to match existing decoding units as are the number of digits for the box number, and the last digit for alarm, trouble, and restore. Number of rounds for each condition is also programmable.

4. Automatic switchover to battery power is performed upon AC power loss with a low battery code transmitted if power is not returned in approximately 50 hours. After transmitting a low battery code, the unit bypasses all input circuits to avoid spurious transmission of false alarms.

B. The digitize panels shall operate at 115 volts and shall be provided with low battery detection and tamper switch.

C. The digitize panel shall be provided with Eprom memory type 2716 and shall be capable of box numbers from one (1) to five (5) digits plus zone number of one (1) to ten (1 – 10) telegraph codes, program each zone open or ground telegraph line on failure (or local failure only) and shall have one (1) form “C” trouble relay.

2.20 TANDEM WIRED SMOKE DETECTORS:

A. The Contractor shall furnish and install tandem wired smoke detectors in dwelling units as indicated on the drawings. The Photoelectric smoke detector shall be a Gentex Model 9120 with standby battery or approved equal which shall provide at least the following features and functions:

   1. Nominal sensitivity shall be 2.5%.
   2. The detector shall utilize an infrared LED sensing circuit, which pulses in 4 to 5 second intervals; when subjected to smoke the pulse rate shall increase 8 times. After 2 consecutive pulses in smoke, the detector will alarm.
   3. The detector shall provide minimum 5 to 1 signal-to-noise ratio in the optics frame to assure stability of operation in environments of high RF and transient conditions.
   4. The sensing chamber shall be fully screened to prevent entrance of small insects, thus reducing the probability of false alarms.
   5. A solid-state piezo alarm rated at 90 db at 10 ft.
   6. A visual LED monitor (condition indicator) will pulse in normal operation and steady on in alarm.
   7. An easily accessible test knob shall be provided. The test knob in the TEST position will simulate an actual smoke condition of approximately 3.4% causing the detector to alarm within 20 seconds. Also have the capability of testing to 0.85% as a required minimum.
   8. The detector shall have tandem interconnect capability of up to 20 units or 6 units with relay.
   9. The manufacturer shall provide other compatible detector models with the following operations features:
a. 135°F isolated thermal with normally opened contact for remote connection to local alarm or annunciator.
b. 135°F integral thermal.
c. Auxiliary "Form A/Form C" relay contacts for initiating remote functions and annunciation.
d. Relay option that is capable of activation by tandem interconnect wire. Thermal sensor shall be self-restoring.
e. Unit must be UL 217 listed for both wall and ceiling mount.

10. All equipment shall be completely factory assembled, wired and tested, and the contractor shall be prepared to submit a certified letter testifying to this condition.

2.21 TANDEM WIRED SMOKE DETECTORS (BARRIER FREE UNITS):

A. This Contractor shall furnish, install and wire a Gentex Model 7109CS-C with standby battery or approved equal photo electric smoke detector in each barrier free dwelling unit as indicated on the drawings. The smoke detector shall meet the following requirements:

1. Nominal sensitivity shall be 2.5%.
2. The detector shall utilize an infrared LED sensing circuit which pulses in 4 to 5 second intervals; when subjected to smoke the pulse rate shall increase 8 times. After 2 consecutive pulses in smoke the detector will alarm.
3. The detector shall provide minimum 5 to 1 signal-to-noise ratio in the optics frame to assure stability of operation in environments of high RF and transient conditions.
4. The sensing chamber shall be fully screened to prevent entrance of small insects, thus reducing the probability of false alarms.
5. A solid state piece alarm rated at 90 db at 10 ft.
6. A visual LED monitor (condition indicator) will pulse in normal operation and steady on in alarm.
7. The visual signal shall have a minimal output of 175 candela.
8. An easily accessible test knob shall be provided. The test knob in the TEST position will simulate an actual smoke condition of approximately 3.4% causing the detector to alarm within 20 seconds. Also, the detector shall test for the most sensitive setting. An alarm during this test will be a maintenance indicator.
9. The detector shall be provided with a Form C contact for remote annunciation purposes.
10. The manufacturer shall provide other compatible detector models with the following optional features:
   a. 135°F isolated thermal with normally opened contact for remote connection to local alarm or annunciator.
   b. 135°F integral thermal.
   c. Auxiliary "Form A/Form C" relay contacts for initiating remote functions and annunciation.
   d. Relay option that is capable of activation by tandem interconnect wire. Thermal sensor shall be self-restoring.
   e. Unit must be U. L.217 listed for both wall and ceiling mount.
f. Unit shall also meet all requirements of the Americans with Disabilities Act (ADA).

2.22 FIRE PROOF SEAL MATERIAL

A. Fire Stop Foam:
   1. The fire stopping sealant shall be a one-part, neutral curing silicone sealant. The sealant shall be completely water resistant and shall contain no solvents nor inorganic fibers of any kind. The through-penetration firestop sealant shall allow movement of +25% and shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479). The firestop joint sealant shall allow movement up to +50% and shall be UL Classified and tested to the requirements of UL2079.

B. Firestop Mortar:
   1. The fire stopping material shall be a lightweight, fast drying Portland cement based material. The density of the wet mortar shall be < 45 lb./cu.ft. The specified mortar shall be approved for a wide range of applications including combustible and non-combustible penetrants when used by itself or in combination with other products from the same manufacturer. The firestop mortar shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479).

2.23 SEALED MAINTENANCE BATTERY SYSTEM

A. Equipment shall be a 12-volt emergency lighting unit of selected capacity maintenance free, medium life, sealed lead battery and solid-state fully automatic voltage regulated charger able to recharge the battery in accordance with U.L. Standard 924. Series units shall include such controls as: "Push-to-test" switch, 120/277 dual voltage transformer; low voltage disconnect circuit; load relay with one or two fused distribution circuit; "brownout" circuit, lockout feature and two-color LED charge monitor. Equipment shall be available in two cabinet sizes...decorator compact with woodgrain vinyl front and standard type...both constructed of 20-gage steel with standard beige baked enamel finish, keyhole mounting slots, removable charge and control chassis, and shall be able to accommodate the mounting of up to two tungsten halogen or sealed beam heads on unit. Equipment shall be U.L. Listed.

B. Equipment shall be manufactured by Emergylite, Chloride and Surelite. Battery capacity shall be as indicated on the Drawings.

2.24 CARBON MONOXIDE DETECTOR

A. This Contractor shall furnish and install a carbon monoxide detector in each dwelling unit as indicated on the drawings.

B. The carbon monoxide detectors shall be BRK Electronics Model CO5120PDBN or equal as manufactured by Kidde or Firex.

C. The carbon monoxide alarm shall provide the following features and functions:
   1. A permanently installed carbon monoxide sensor and an LCD multifunction digital display with peak CO level memory capability.
   2. Powered by 120V AC, 60 Hz with a monitored 9V battery backup. In battery backup mode, hr battery must last for 8 hours minimum in standby, 12 hours minimum in standby, 12 hours minimum in alarm, and 7 days trouble.
   3. A visual LED (red) power-on indicator to confirm unit is receiving power or to confirm unit has switched to battery backup mode. In battery backup mode, digital display indicates “bAt”; “bAt” indication will flash if battery is weak or missing.
4. The sensor is adjusted not to detect CO levels below 30 PPM and will not alarm when exposed to constant levels of 30 PPM for 30 days. It will alarm at the following levels under 30% to 7-% relative humidity: 400 PPM CO between 4 and 15 minutes, 150 PPM CO between 10 and 50 minutes and 70 PPM CO between 60 and 240 minutes.

5. A test/silence button to check all detector functions and to silence any unwanted alarms. In addition, the unit shall have a low battery silence feature to quiet the low battery chirps for up to 8 hours.

6. The unit shall perform self diagnostic tests every second and issue a malfunction warning both audibly (three rapid chirps) and visually (“Err” in display) if the unit malfunctions.

7. A solid state piezo horn rated at 85dB at 10 ft. that provides a repeating horn pattern: 4 beeps, pause, 4 beeps, and pause.

8. A “Smart Interconnecting” feature allows the unit to be interconnected to BRK smoke alarms.

9. If there is a smoke event, the CO5120PDBN horn pattern shall emit the same sound as the smoke alarm, that is 3 beeps, pause, 3 beeps, and pause. If there is a CO event, the interconnected CO alarms sound their normal horn pattern.

10. The unit shall center mount to any standard electrical junction box up to 4” size without screw removal and shall be listed for wall or ceiling mounting.

11. The unit shall center mount to any standard electrical junction box up to 4” size without screw removal and shall be listed for wall or ceiling mounting.

12. The unit shall have an optional locking mechanism to discourage theft of battery and/or theft of the unit.

13. The unit shall have a plug in connector and be capable of interconnection of up to 18 alarms.

14. The unit shall at a minimum meet the requirements of UL 2034, ICBO, BOCA, SBCCI and CABO.

2.25 CARBON MONOXIDE/SMOKE DETECTOR

A. This Contractor shall furnish and install a carbon monoxide detector in each dwelling unit as indicated on the drawings.

B. The carbon monoxide/smoke detectors shall be BRK Electronics Model SC7010BV or equal as manufactured by Kidde or Firex.

C. The combination carbon monoxide/smoke detectors shall provide the following features and functions:

1. Photoelectric smoke sensing chamber and an electrochemical CO sensor.

2. Powered by 120V AC, 60 Hz and have a monitored battery backup and a solid state piezo horn rated at 85 dB at 10 ft. and shall be capable of self-restoring. The horn shall have a lower and varying horn frequency to make it easier for the elderly with normal age related heating loss to better hear the horn.

3. A voice warning of smoke or carbon monoxide detected in addition to speaking 11 pre-programmed locations, e.g. “Warning, Evacuate, Smoke Basement”.

4. The unit shall have an “End of Life” signal. This signal should be capable of temporarily being silenced for up to 2 days. After about 2 days, the signal will resume. After about 2 – 3 weeks the signal cannot be silenced.
5. A visual power-on indicator to confirm unit is receiving AC power or has switched to battery backup mode. Separate LED’s to indicate a smoke or CO alarm.

6. The CO sensor is adjusted not to detect CO levels below 20 PPM and will not alarm when exposed to constant levels of 30 PPM for 30 days. It will alarm at the following levels: 400 PPM CO between 4 and 15 minutes, 150 PPM CO between 10 and 50 minutes and 70 PPM CO between 60 and 240 minutes.

7. Two latching features: Alarm Latch to easily identify initiating alarm after alarm condition has subsided. Two silence features: Alarm silence to temporarily silence nuisance alarms. Low Battery Silence to silence low battery chirp for up to 8 hours.

8. Two locking features – tamper resistant locking pins that lock battery drawer and/or alarm to mounting bracket.

9. The unit shall be capable of operating between 40°F (4°C) and 100°F (38°C) and relative humidity between 10% and 95%.

10. The unit shall have a plug in connector and be capable of interconnection of up to 18 alarms, 12 of which can be smoke alarms.

11. The unit shall at a minimum meet the requirements of UL217 and UL2034, CSFM, NFPA 72 and 720 and the ICC.

2.26 CABLE TELEVISION DISTRIBUTION SYSTEM

A. This Contractor shall furnish and install the cable television distribution service entrance conduits and distribution of sizes indicated on the drawings.

B. It is intended that this Contractor shall install all CATV distribution system cables and outlets. Outlets and cables shall be furnished by the television system supplier and installed by the Electrical Contractor.

C. Soft iron pull wires shall be left in all empty CATV distribution system conduits for use by the owner.

D. Construction Details:

1. Belden 1829A RA6 cable shall be used to prewire television outlets in dwelling units.

2. The longest drop shall not exceed 150’.

3. The longest drops will be home run from dwelling unit closet to electric room as indicated on the plans.

4. All drops will be tagged with the apartment number at the lockbox location.

5. Do not kink, form tight (90°) ninety degree angles, pieces the plastic jacket, damage or mishandle the cable in any way.

6. Do not use staples, nails, tacks, etc. to secure the drop cables. Roka or Hiat cable clips or tywraps will be provided upon request.

7. Leave eight (8) inch tails in the television system outlet box. Leave six (6) foot tails at the lockbox location.

8. Proper clearance from heating or hot water pipes is to be maintained.

9. Cable TV finished wall plates will be installed by the Electrical Contractor.

10. Upon completion of the pre-wiring and final inspection by COMCAST, active plant will be brought to the building and spliced into servicing equipment.
11. COMCAST must be given timely notice if system (hard line) must be brought into the building prior to the completion of the finish work.

12. At least three inch (3") PVC conduit is to be used for all underground feeds. Timely notice must be given so that correct size can be determined.

13. Any conduit is to be buried at a depth no less than eighteen inches (18").

14. No ninety degree (90E) sweeps or bends in conduit are permissible. The most acute angle acceptable is forty-five (45E) degrees.

15. Nylon pull lines are to be provided for future use. The conduit is to be capped at either end. Any damaged or poorly installed conduit will be the responsibility of the owner/contractor.

2.27 TELEPHONE SYSTEM

A. The Electrical Subcontractor shall furnish and install all wall phone outlets, and associated wiring so as to provide a complete and working telephone system between all telephone outlets, telephone network interface units and the floor telephone backboard.

B. The Electrical Subcontractor shall be responsible for all telephone system wiring between wall phone outlet, telephone network interface unit and floor telephone backboard. Telephone outlet wiring shall be cat. 5 cable.

C. The electrical Subcontractor shall be responsible for furnishing and installing telephone system wiring between dwelling unit telephone outlets to dwelling unit network telephone interface unit and dwelling unit network telephone interface unit and telephone backboard located on the respective floor.

D. The Electrical Subcontractor shall be responsible for all telephone system cables between telephone backboards on respective floors.

E. The Electrical Subcontractor shall be responsible for providing all telephone wall plates and phone jacks.

F. The Electrical Subcontractor shall be responsible for furnishing and installing 110 punch blocks for tenant telephone cable terminal. The Electrical Subcontractor shall be responsible to punch down telephone cables on the punch block. The Electrical Subcontractor shall coordinate termination with Verizon.

2.28 MULTI-METERING EQUIPMENT

A. Multi-metering equipment shall be Siemens Electrical Products, Square "D", General Electric or Cutler Hammer. All components shall have been tested and Underwriters' laboratories listed for use as an integral part of the multi-metering system. This equipment shall be manufactured according to NEMA standards. Installation shall be made as herein specified and shown on the Drawings.

B. Enclosure shall be constructed of formed and welded code gauge sheet metal, finished with gray baked enamel over a rust-inhibiting phosphate primer and suitable for indoor surface mounting. Mounting holes shall be provided in the back of each device for attaching to walls or other vertical support. All devices must be bonded together with bolted connection. Meter units shall be provided with individual removable covers for each meter position. All compartments containing unmetered circuits shall be provided with sealing means. Each circuit breaker shall be provided with sealing means. Each circuit breaker position shall be provided with means for sealing or padlocking each individual breaker in the OFF position. Equipment shall be series rated for 65,000 amperes.
C. All components shall be factory assembled with all current carrying parts constructed of plated bus bars. Components shall be constructed of such design as to require only main inter-connecting cross bus to provide a complete bussed meter center. Meter units must be connected in a "hot" sequence arrangement.

D. Meter-breaker components must be of such design to permit arrangement to allow load conduits to enter at the top or bottom in the same assembly.

E. Meter sockets shall be 125 amp 5-jaw non-circuit closing type. This Contractor shall install by-pass jumpers and glass covers on all sockets.

2.29 EXHAUST FAN SWITCH

A. This Contractor shall provide exhaust fan switch with programmable fan speed control, duty cycle, and timer.

B. Speed control 40-100% fan speed adjustment with soft start feature.

C. Timer 12 or 24 hour operation.

D. Program override feature to enable full speed boost.

E. Lithium battery backup.

F. Unit shall be manufactured by Tamarack Technologies, Inc. of Buzzards Bay, MA.

2.30 ELECTRIC HEATING EQUIPMENT

A. The Electrical Contractor shall install and wire all electric heating equipment as specified and indicated on the Drawings and HVAC schedules.

B. Heaters shall be of the size and voltage indicated by schedule on the Drawings.

2.31 DOOR BELL SYSTEM:

A. The Electrical Contractor shall furnish, wire and install a complete door bell system as indicated on the plans.

B. Transformer shall be Nutone #515N, Benjamin #T590, or Edwards #998.

C. Chime shall be Nutone #LB-18, Benjamin T581, or Edwards C-75.

D. Door buttons shall be Nutone PB-6, Benjamin T485, or Edwards 634.

2.32 LIGHTING CONTACTORS:

A. This Contractor shall furnish and install lighting contactors as herein described and indicated in the contactor schedule on the plans. Contactors shall be an Asco type 917 or approved equal as manufactured by Square D or General Electric.

1. 20 Ampere rating Asco 917
   a. The remote control switch shall be electrically operated by a dual-acting, single-solenoid mechanism that is inherently interlocked and mechanically held in both the open and closed positions. The main contact shall be power driven in both directions. Positive locking of contact positions shall not be dependent on gravity, hooks, latches or semi-permanent magnets.
   b. The remote control switch shall be capable of operating in any position. Provisions shall be incorporated for manual operation during inspection and maintenance.
   c. The remote control switch shall be Underwriters' Laboratories listed under U 508. Main contacts shall be double-break, continuous-duty rated 20 amperes to 600
volts, AC, 60 Hz (30 amperes to 600 volts ACm 60 Hz, for general-purpose loads), and be marked for ballast lighting (electric discharge lamps), tungsten and general-purpose loads. Lighting contactors requiring derating when used in an enclosure or with tungsten lamp loads shall not be acceptable.

d. The remote control switches shall be provided with clamp-type, self-rising terminal plates for solderless connection of line, load and control conductors. Terminals shall accept a wire range of #18 AWG to #10 AWG CU.

e. The number of poles, up to a maximum of 12, on a single remote control lighting contactor shall be provided as indicated on the plans.

f. The remote control switches shall be U listed for the following short-circuit withstand current ratings when coordinated with a U-listed molded case circuit breaker rated 30 amperes:

1) 22,000 amps rms symmetrical, 250 volts, 60 Hz

g. The operating coil and main contacts shall be replaceable from the front without major disassembly and visual indication shall be provided for each contact.

h. Provisions shall be included to permit remote pilot lamp-type visual indications without the necessity for auxiliary contacts or additional wiring.

i. Each remote control switch shall be furnished with an owner's manual providing installation and operation instruction.

j. Provide accessory No. 48 three wire control interface module. Interface module shall allow the building solid state energy management system to control contactors.
PART 3: EXECUTION

3.1 DRAWINGS
A. The drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, ducts, conduits and fixtures. The locations of all items shown on the drawings or called for in the Specifications that are not definitely fixed by dimensions are approximate only. The exact location necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Architect before being installed. This Contractor shall follow drawings in laying out work and checking drawings of other trades to verify spaces in laying out work to be installed.

B. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with the installation. If directed by the Architect, this Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work. The Architect shall be the sole judge of what a "reasonable modification" in the layout is.

3.2 COORDINATION OF TRADES
A. This Contractor shall give cooperation to other trades and shall furnish (in writing, with copies to the Architect) any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay and in accordance with General and Supplementary Conditions.

B. Where the work of this Contractor will be installed in close proximity to work of other trade, or where there is evidence that the work of this Contractor will interfere with work of other trades, he shall assist in working our space conditions to make a satisfactory adjustment. If so directed by the Architect, this Contractor shall prepare composite working drawings and sections at a suitable scale not less than 1/4" -1"-0", clearly showing the installation of his work in relation to the work of other trades. If this Contractor installs his work before coordinating with other trades, or so as to cause interference with work of other trades, he shall make necessary changes in his work to correct the conditions without extra charge. All cutting, patching, excavation and backfilling, shall be done by this Contractor in accordance with General and Supplementary Conditions.

3.3 PROCEDURE
A. This Contractor shall provide all labor and materials necessary for the complete and substantial execution of the work, including all transportation, scaffolding, apparatus, utensils, tools, etc., requisite for the faithful performance of the work to the true intent and meaning of the Specifications, Drawings, and in accordance with General and Supplementary Conditions. All workmanship and materials shall be of the best of their respective kinds.

B. This Contractor shall store his material and equipment prior to installation only where designated by the Owner. He shall be responsible for all his property stored on the premises and shall hold the Owner free from liability for loss by theft or carelessness of employees of the Owner, or of other Contractors. This Contractor must take particular care to protect any finished work from injury caused thereto by his operations. After completion of the work, this Contractor shall remove all waste, rubbish and other materials left as a result of his operations and leave the premises in clean condition.
3.4 FIELD MEASUREMENTS
A. This Contractor shall verify in the field all measurements necessary for his work and shall assume responsibility for this accuracy.

3.5 WORKMANSHIP
A. The entire work provided in this Specification shall be constructed and finished in every respect in a workmanlike and substantial manner. It is not intended that the drawings shall show every pipe, fitting and appliance, but this Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice and satisfaction of the Architect.

3.6 CLEANING AND PROTECTION
A. All materials and equipment shall be carefully protected during shipment and protected during installation and properly handled and stored at the job site so as to prevent damage. This Contractor shall assume full responsibility for protection of work until its completion and final acceptance.
B. Upon completion of this work, this Contractor shall clean all fixtures and equipment and replace damaged parts. Upon failure of this Contractor to fulfill his obligation, this work will be taken care of at his expense.

3.7 INSTALLATION OF WIRING AND CONDUIT
A. In general, all conduits shall be run concealed unless otherwise indicated to be run exposed.
B. Exposed conduits shall be run parallel to, or at right angles to, the walls of the building, and all bends shall be made with standard conduit ells or conduits bent to, not less than, the same radius. Horizontal runs of exposed conduits shall be close to ceiling beams, passing over water or other piping where possible and shall be supported by pipe straps or by other approved means, not more than 5’ apart. Installation of exposed conduits in finished areas of the building shall be checked with the Architect for layout before installation to conform to the pattern of the structural members, an when completed, is to present the most unobtrusive appearance possible. No exposed conduits will be permitted on walls or partitions in public areas.
C. In no place shall a conduit be run within 3” of hot water pipes, or appliances, except where crossing is unavoidable and, in that case, the conduit shall be kept at least 1” from covering or pipe crossed.
D. Conduits shall be supported on approved type if galvanized wall brackets, ceiling trapeze, strap hangers or pipe straps, secured by means of toggle bolts on hollow masonry units or expansion bolts in concrete or brick, matching screws on metal surfaces and wood screws on wood construction. No nails shall be used as a means of fastening boxes or conduits.
E. In general, no splices or joints will be permitted in either feeder or branches except at outlets or accessible junction boxes.
F. All splices in wire #8 AWG and smaller shall be standard pigtail, made mechanically tight, soldered and insulated with proper thickness of insulating tape. Wire splicing nuts as manufactured by Minnesota Mining Company (Scotch Lock) or Ideal wire nuts may be used, subject to the local wire inspector.
G. Wire #6 and larger shall be connected to panels and apparatus by means of approved lugs or connectors. Connectors shall be solderless type, sufficiently large to enclosure all strands of the conductors and securely fastened.
3.8 CUTTING, PATCHING AND DRILLING
   A. It shall be the duty of the General Contractor to provide all cutting, patching, and drilling for electrical installation in accordance with General and Supplementary Conditions.

3.9 GROUNDING
   A. This Contractor shall furnish all fittings, clamps, conduits and wire of proper size to make ground connections between all apparatus and conduit and the water piping as required by the latest edition of the National Electrical Code and as indicated on the Drawings. Any ground wires shall be run in conduit of size required by the National Electrical Code.

3.10 QUIET OPERATION
   A. All equipment and material furnished by this Contractor shall operate under all conditions of load without objectionable noises or vibrations, which, in the opinion of the Architect, is objectionable. Where sound or vibration conditions arise which are considered objectionable by the Architect, this Contractor shall eliminate same in a manner approved by the Architect.

3.11 FINAL INSPECTION AND TEST
   A. Prior to test, feeders and branches shall be continuous from service contact point to each outlet; all panels, feeders and devices connected and fuses in place. Test system free from short circuits and grounds with insulation resistances not less than outlined in the National Electrical Code. Provide testing equipment necessary and conduct test in presence of the Owner's authorized representative.

3.12 GUARANTEE
   A. All materials, items of equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in materials and workmanship for a period of not less than one (1) year from the date of final acceptance of the work and in accordance with General and Supplementary Conditions.

3.13 SLEEVES AND OPENINGS
   A. Sleeves and openings for piping through walls, floors and other parts of the structure shall be provided at all points shown on the Contract Drawings and where indicated by the Architect. The conduit shall go through the sleeve consisting of the next size conduit that will provide clearance. Sleeve ends shall be flush with surfaces.

3.14 WIRING METHODS
   A. Fire alarm system wiring shall be installed concealed and shall be installed in electrical metallic tubing where wiring is to be installed exposed or as indicated on the electrical drawings.
   B. Fire alarm system initiation circuit wiring shall be twisted pair non-shielded cable as required by the manufacturer.
   C. Branch circuit wiring installed exposed shall be installed in electrical metallic tubing where exposed in non public areas.
   D. Dwelling unit branch circuit wiring shall be non-metallic sheathed cable.
   E. Feeders to the dwelling unit load centers from the electrical distribution system shall be “SER” cable (copper) between electrical metering and distribution equipment and respective dwelling unit load centers.
   F. Feeders to house panelboards shall be installed in electrical metallic tubing.
G. All service equipment wiring shall be installed in rigid steel conduit.
H. Telephone system wiring shall be installed concealed.
I. Cable television system shall be installed concealed.

3.15 SUPERINTENDENCE OF WORK
A. This Contractor shall give his personal superintendence to the work and shall retain at the job site during the period of construction, a competent foreman, satisfactory to the Architect, who shall be in full charge of the work under this Section in accordance with General and Supplementary Conditions.

3.16 SITE VISITATION
A. This Contractor shall be required to visit the site and to have examined the existing conditions which may affect his work under this Contract and in accordance with General and Supplementary Conditions. Failure to do so shall be his responsibility and no claims for extra compensation or extension of time shall be allowed because of lack of compliance herewith.

3.17 CONFLICT BETWEEN PLANS AND SPECIFICATIONS
A. In case of conflict between contract plans and the specifications the Architect will decide which takes precedence.

3.18 PROTECTION
A. This Contractor shall be responsible for his work and equipment until finally inspected, tested and accepted; careful storage of materials and equipment which are not immediately installed after delivery to site; and closure of open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material and in accordance with General and Supplementary Conditions.

3.19 SECONDARY ELECTRICAL SERVICE
A. Secondary services will be 120/240 volts, 1-phase, 3-wire, originating at the site pole mounted transformers.
B. NSTAR will furnish and install meters, current transformers and test switches for installation by this Contractor.
C. The Contractor shall make final connection to the secondary terminals of the building pad mounted transformer.
D. The Owner shall pay all backcharges assessed by NSTAR for electric service installation.
E. NSTAR shall furnish and install the pole mounted transformer.

3.20 TESTING AND INSPECTION
A. Test and inspect work of this Section as required by Contract Documents, codes, standards and authorities that have jurisdiction, to satisfaction of Architect. Tests specified in this Section shall be construed as minimum requirements. Notify Architect and Authorities at least two working days prior to testing.
B. Furnish Architect with certificates of testing and inspection of electrical systems by an independent testing company, if required by local codes, indicating approval of Authorities having jurisdiction, and conformance to Specifications.
C. Perform all required adjustments and settings. Verify and correct deficiencies as necessary including voltages, tap settings, trip settings and phasing of equipment from distribution system to point of use. Voltage settings shall be tested and adjusted as necessary at locations of distribution system, when building is complete and operational.

D. Provide necessary testing equipment.

E. Failure or defects in workmanship or materials revealed by tests shall be replaced and subsequently retested to the satisfaction of the Architect.

F. Remove and replace any transformer, ballast, dimmer, reactor or solenoid found to have noise output exceeding specified level of identical devices.

G. Owner will not be responsible for material and equipment before testing and acceptance.

H. Test wiring, buswork, and connections for continuity and grounds by "megger" test. Minimum insulation resistance between conductors and ground shall be as follows:

I. Conductor current carrying capacities from 51 to 100 amperes, inclusive: 100,000 ohms.

J. Conductor current carrying capacities from 101 to 200 amperes, inclusive: 50,000 ohms.

K. Conductor current carrying capacities from 201 to 400 amperes, inclusive: 25,000 ohms.

L. Conductor current carrying capacities from 401 to 800 amperes, inclusive: 12,000 ohms.

M. Conductor current carrying capacities over 800 amperes: 5,000 ohms.

N. Grounding:

1. Main ground electrode system shall not exceed 5 ohms unless specified otherwise.

2. Verify ground resistance by ground continuity test between main ground system and equipment frame system between main ground system and equipment frame system neutral and/or derived neutral point.

3. Perform ground continuity test by passing minimum of ten amps DC between ground reference system and ground point. Calculate resistance by voltage drop method.

END OF SECTION