PROJECT MANUAL

UNIVERSITY OF MAIN AT FARMINGTON
EARLY CHILDHOOD EDUCATION CENTER DESIGN

April 8, 2022

CHA PROJECT #: 057699

Prepared for:
UNIVERSITY OF MAIN AT FARMINGTON
FARMINGTON, MAINE

Prepared by:
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Portland, Maine 04101
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### PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

**DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS**

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Legend, Abbreviations and Symbols F-001
Fire Protection Plan F-100
Fire Protection Removal Plan FD-100
Fire Protection Details F-600

END OF SECTION 00 01 15
Bids for: **UMF - EARLY CHILDHOOD EDUCATION CENTER**

Shall be submitted electronically to cppmquestions@maine.edu
With the following Email Subject Line: **UMF – Early Childhood Education Center**

Bids will be received until **2 PM on Thursday, May 5, 2022** at which time Bids will be opened and read aloud via Zoom.

Bid opening attendance is available via PC, Mac, Linux, iOS or Android:
[Zoom Meeting Link](#)

Password: 525300
Or via telephone US:
+13126266799, *525300# US (Chicago)
+16465588656, *525300# US (New York)
Meeting ID: 848 7420 6389

Bids received after the stated time will not be considered and will be returned unopened.

Electronic bid submissions submitted to: [rtannenbaum@chacompanies.com](mailto:rtannenbaum@chacompanies.com).

Bid Submissions may be mailed as well dropped off at:

Facilities Management Office
147 Farmington Falls Road
Farmington, Maine 04938

All Bids must be accompanied by a copy of a satisfactory Bid Bond for 5% of the Bid (checks will not be accepted) which shall be in conformity with the form of Bond contained in Section 00 43 13 of the Specifications. Upon determination of the apparent low bidder, the University will contact the low bidder and request an original hard copy of the bid bond be delivered within 72 hours. The University reserves the right to waive all formalities and reject any or all bids or to accept any bids. Scholarships, donations or gifts to the University will not be considered in the evaluation of responses.

Electronic Bid Submission Requirements:
A **SIGNED** virus-free electronic bid form must be submitted as follows:
- The bid and bid bond must be submitted electronically as a single PDF file to the email address shown above.
- Electronic submission must be received by the required **Thursday, May 5th, 2022** reflected above.

The successful Bidder will be required to furnish a 100% Performance Bond and a 100% Payment Bond to cover the execution of the Contract which shall be in conformity with the form of Bonds contained in Sections 00 61 13.13 and 00 61 13.16, respectively, of the Specifications and shall be for the Contract amount.

Bidders should attend a mandatory pre-bid meeting on either Thursday, April 21, 2022 at 9 am or on Monday, April 25, 2022 at 2pm. Attendees are to meet at 274 Front Street, Farmington, Maine. Copies of plans and specifications will not be available at the pre-bid meeting. Acquiring or reviewing plans and specifications prior to the meeting is advised.

**Project Summary:** The work involves the interior renovation of the existing free-standing building at 274 Front Street at location as indicated on Drawings. Work includes, but is not limited to, selective demolition, and addition of exterior doors and windows, concrete pads and patios at exterior door locations, new and reuse of existing roof penetrations. Work also includes metal partitions, insulation, gypsum board walls and ceilings, acoustical ceilings, resilient flooring, carpeting, custom cabinets and fixtures, carpentry, interior glass storefront...
systems, painting, wood doors, metal doors, metal frames, door hardware, toilet partitions and accessories, signage, fire protection and detection systems, security systems, electrical, heating, ventilation, and air conditioning complete and ready for use.

The electronic documents (.pdf) may be examined and downloaded at the following site:

https://www.umf.maine.edu/facilities/home/advertisements-facilities-management/

Any questions related to the plans and specifications must be submitted prior to 2 pm on Tuesday, April 26, 2022 via email to rtannenbaum@chacompanies.com, Architect at CHA Architecture and Lachelle.1.lackey@maine.edu, Project Manager at University of Maine at Farmington.

In complying with the letter and spirit of applicable laws and pursuing its own goal of diversity, the University of Maine System shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, including transgender status, gender expression, national origin, citizenship status, age, disability, genetic information, or veterans’ status in employment, education, and all other areas of the University System. The University provides reasonable accommodations to qualified individuals with disabilities upon request. General contractors, subcontractors, and product suppliers bidding on this project must subscribe and adhere to same.

UNIVERSITY OF MAINE SYSTEM
by and through
UNIVERSITY OF MAINE AT FARMINGTON
Laurie A. Gardner, Chief Business Officer, for
University of Maine System Board of Trustees

END OF SECTION 00 11 13
INSTRUCTIONS TO BIDDERS

1. At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and be thoroughly familiar with the plans and contract documents, including all addenda. The failure or omission of any bidder to receive or examine any form, instrument, or document shall not relieve any bidder from any obligation in respect to the bid. The Owner reserves the right to accept or reject any or all bids as may best serve the interests of the University of Maine System.

2. Subject to the University System’s right, reserved herein, to accept or reject any or all bids, the General Contractor will be selected on the basis of the sum of the lowest base bid, plus such of the alternates as the University System desires to use.

3. The University System is exempt from the payment of Federal Excise Taxes on articles not for resale and the Federal Transportation Tax on all shipments. The Contractor shall quote less these taxes. Upon application, exemption certificates will be furnished when required.

4. No proposal may be withdrawn during a period of thirty (30) calendar days immediately following the opening thereof.

5. No contract may be assigned, sublet or transferred without the written consent of the University of Maine System.

6. All individuals not residents of this State must comply with the provisions of 14 MRSA §704-A.

7. The successful bidder, or bidders, will be required to furnish 100% Contract Bonds to cover the execution of the contract, in accordance with the AIA Document A101 - 2017 Exhibit A and Article 11 of the AIA Document A201 – 2017 General Conditions of the Contract for Construction.

8. Contractors may be required to furnish a statement of their business experience, record of accomplishments, and financial responsibility, at the discretion of the University System.

9. The base bid shall be based on the materials, methods, equipment and products, as specified.

10. Bidders shall submit the bid on the Bid Form provided in the Specifications, Section 00 41 13.

11. Any materials, methods, equipment and products not herein specified, but worthy of consideration by any General or Subcontractor, may be introduced by a separate letter attached to the regular bid. The Bidder shall state the cost comparison with the specified materials, methods, equipment and products, and the reason for the suggested substitution. It shall be understood by all bidders that the attached letter proposing substitutions shall not be used to determine the low bidder and that all bids are based on specified products.

12. Telegraphic or facsimile proposals will not be considered, but modification of proposals already submitted will be considered if received prior to the hour set for receipt of proposals. If the telegram or facsimile discloses the amount of the proposal, the proposal will be declared invalid. The bidder bears full responsibility to assure that the correction is delivered to the proper location and within the time required.

13. Where a bidder wishes a product to be considered an “approved equal” for bidding purposes, the product, along with all supporting documentation, shall be submitted to the architect for review a minimum of 10 calendar days prior to the bid opening date or the file bid due date, if file bids are required on the project. Products which are determined to be an “approved equal” for bidding purposes shall be listed in an addendum issued so as to be received by bidders no less than 72 hours prior to the bid date or the file bid due date if file bids are required.

14. Where the Bid Form requires the tabulation of subcontractors other than “File Bidders,” the Bidder shall list the name of the firm the bidder intends to use in the event the bidder receives the contract award.

15. Bidders may appeal the award decision by submitting a written protest to the University of Maine System.
Chief Facilities and General Services Officer within five (5) business days of the date of the award notice (Notice of Award) with a copy of the protest to the successful bidder. The protest must contain a statement of the basis for the challenge.

END OF SECTION 00 21 13
SECTION 00 41 13
BID FORM – SHORT FORM

BIDDER: ____________________________________________

Physical/Street Address ____________________________________________

City, State ZIP ____________________________________________

University of Maine at Farmington
Keenan Farwell, Director of Facilities
224 Main Street
Farmington, ME 04938

Having carefully examined the form of contract, general conditions and plans and specifications contained therein for UMF - EARLY CHILDHOOD EDUCATION CENTER, as well as the premises and conditions affecting the work, we the undersigned propose to furnish all labor, equipment, and materials necessary for and reasonably incidental to the construction and completion of this contract for the sum of ________________ Dollars ($______________).

Allowance No. 1, (INSERT): $____________ to be included as part of the Base Bid Amount Listed Above.

UNIT PRICE ITEMS:

The undersigned agrees to perform additional work as directed at the following prices:

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
</tbody>
</table>

This proposal includes the cost of 100% Performance Bond plus 100% Payment Bond.

The receipt of the following addenda to plans and specifications is hereby acknowledged:

ADDENDUM # ______ DATED __________ ADDENDUM # ______ DATED __________

ADDENDUM # ______ DATED __________ ADDENDUM # ______ DATED __________

Any material or materials not specified in the bidding document but worthy of consideration may be introduced by the bidder by a separate letter attached to this Bid. A cost comparison must be included giving the comparison with the Material specified and the reason for the suggested substitution. The basic bid shall be as specified.

The undersigned agrees, if this Bid is accepted to sign a contract and deliver it, along with the bonds and affidavits for all insurance specified within twelve (12) calendar days after the date of notification of such acceptance, except if the 12th day falls on a Saturday, Sunday or holiday, then the conditions will be fulfilled if the required documents are received before 12 o’clock noon on the day following the holiday, or the Monday following the Saturday or Sunday, and as a guarantee thereof, herewith submits a bid bond as required.

The undersigned agrees, if awarded the Contract, to complete the work on or before _________________. The undersigned also agrees, if awarded the Contract, that no more than 80% of the contract amount will be sublet to other contractors.
Signed (by individual authorized to sign contract) ____________________________________________

By (printed name & title) _________________________________________ Phone ____________

PO Box (if applicable) ______________________________________________ Email ____________

NOTE: If bidder is a corporation, write State of Incorporation, and if a partnership, give full names of all partners.

END OF SECTION 00 41 13
KNOW ALL BY THESE PRESENTS, THAT WE, the undersigned, as PRINCIPAL __________________________
______________________________, and __________________________
______________________________ as SURETY, are hereby held and firmly bound unto the Treasurer
of the UNIVERSITY OF MAINE SYSTEM in the penal sum of __________________________
______________________________, for the payment of which, well and truly to
be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors and
assigns, signed this __________________________ day of __________________________, 20______.

The condition of the above obligation is such that whereas the Principal has submitted to UNIVERSITY OF
MAINE SYSTEM, BY AND THROUGH THE UNIVERSITY OF MAINE AT FARMINGTON, a certain
proposal, attached hereto and hereby made a part hereof, to enter into a contract in writing for the
UMF - EARLY CHILDHOOD EDUCATION CENTER.

NOW THEREFORE,
(a) If said proposal shall be rejected, or, in the alternate
(b) If said proposal shall be accepted and the Principal shall execute and deliver a contract in the form of
contract attached hereto (properly completed in accordance with said proposal) and shall furnish a bond for
faithful performance of said contract, and for the payment of all persons performing labor or furnishing
materials in connection therewith, and shall in all other respects perform the agreement created by the
acceptance of said proposal, then this obligation shall be void, otherwise the same shall remain in force and
effect: It being expressly understood and agreed that the liability of the surety for any and all claims
hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its bond shall
be in no way impaired or affected by any extension of the time within which the principal may accept such
proposal: and said Surety does hereby waive notice of any such extension.

In the event suit is brought upon this bond by the Treasurer of the UNIVERSITY OF MAINE SYSTEM, Surety
shall pay reasonable attorneys’ fees and costs incurred by the Treasurer of the UNIVERSITY OF MAINE
SYSTEM in such suit.

IN WITNESS WHEREOF, the Principal and Surety have hereunto set their hands and seals, and such of them
as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their
proper officers, the day and year first set above.

PRINCIPAL:

By: __________________________ L.S.

SURETY:

SURETY ADDRESS:

By: __________________________ L.S.

**DO NOT ALTER LANGUAGE**

END OF SECTION 00 43 13
NOTICE OF AWARD
SAMPLE

DATE

[Contractor]
[Company]
[address]
[City ST ZIP]

RE: NOTICE OF AWARD – EARLY CHILDHOOD EDUCATION CENTER
UNIVERSITY OF MAINE AT FARMINGTON

Dear [Contractor]:

You are hereby notified that the University of Maine System, by and through the University of Maine at Farmington, accepts your Bid of $??,00 for the above named project, subject to final resolution of any bid protests and the parties’ ability to establish and confirm final terms, as well as the execution of a written contract and your furnishing satisfactory bonds within twelve (12) calendar days as provided in the bidding documents.

This Notice of Award will permit you to proceed with the ordering of materials and scheduling the work so that the project can be completed on time. Should you fail to execute a contract or furnish satisfactory bonds within the stipulated time, the bid bond accompanying your proposal will be forfeited to the University of Maine System as liquidated damages.

Enclosed is your contract agreement for signature. Further, please have your surety provide one original each of the Performance Bond and the Payment Bond, as prescribed in Sections 00 61 13.13 and 00 61 13.16 of the bid document, and a properly executed “Power of Attorney.” Please advise your surety agent that the bonds should carry the same date as this Notice of Award and the Contract Agreement. All originals of the signed contract, bonds and insurance certificates should be forwarded directly to Jennifer Sinclair, Capital Contracts Administrator, Capital Planning and Project Management, 5765 Service Building, Orono, ME 04469. Once it is completely signed, a copy of the contract will be returned for your use.

Prior to the start of any work on the construction site, Capital Planning and Project Management must receive Certificates of Liability Insurance as specified in Article A.3 of the AIA Document A101 – 2017 Exhibit A, Insurance and Bonds. Please advise your surety that the certificate holder should be as follows: University of Maine System; Office of Risk Management; Robinson Hall, 46 University Drive, Augusta, ME 04330.

The day-to-day administrative and technical details of this project will be handled by the Architect/Engineer, CHA Consulting, Inc. All correspondence relative to the day-to-day administration of the project should be directed to Robin Tannenbaum, CHA Consulting, Inc., at (207) 775-1059, rtannenbaum@chacompanies.com.

A pre-construction conference on this project will be scheduled as soon as possible. This conference must be attended by your firm’s authorized representative as well as your project superintendent.

Sincerely,

Laurie Gardner
Chief Business Officer

Enclosures
THIS AGREEMENT is made and entered into the _____ day of ______________, 20____, by and between the Contractor, ______________________, and the University of Maine System acting by and through the University of Maine at Farmington, 246 Main Street, Farmington, Maine 04938, hereinafter called the Owner.

WITNESSETH: That the Owner and the Contractor for the considerations hereinafter named agree as follows:

ARTICLE 1. SCOPE OF THE WORK

The Contractor shall furnish all of the materials and perform all of the work described in the Contract Documents entitled UMF - EARLY CHILDHOOD EDUCATION CENTER, prepared by CHA Architecture, acting as and in these Contract Documents entitled the Architect and/or Engineer.

ARTICLE 2: START AND TIME OF COMPLETION

The date of the commencement of work shall be the date of this Agreement and shall be substantially completed on or before __________________________ subject to adjustments as provided in the Contract Documents.

The Contractor and the Contractor’s surety, if any, shall be liable for and shall pay the Owner the following stipulated liquidated damages for each calendar day of delay after the date established for Substantial Completion until the Work is substantially complete: ____________Dollars ($____) per calendar day.

ARTICLE 3: THE CONTRACT SUM

The Owner shall pay the Contractor for the performance of the Contract as follows _______________ Dollars, $ ($___), subject to adjustments as provided in the Contract Documents.

The Contract Sum is based upon the following Alternates and Unit Prices, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

<table>
<thead>
<tr>
<th>Alternate (1)</th>
<th>Alternate (2)</th>
<th>Alternate (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Price</td>
<td>Item</td>
</tr>
</tbody>
</table>

Final payment shall be made after completion and acceptance of the work as provided in the Contract Documents.

ARTICLE 4: THE CONTRACT DOCUMENTS

The Contract Documents for this project, except for modifications issued after execution of this agreement, consist of:

.1 This agreement.

.2 AIA Document A201-2017, General Conditions of the Contract for Construction, as modified by the Owner.
.3 AIA A101 – 2017, Exhibit A, Insurance and Bonds, as modified by the Owner.

.4 The Specifications as outlined in the Project Manual: UMF - Early Childhood Education Center, dated ________________.

.5 The Drawings as listed in the Project Manual.

ARTICLE 5: OWNER’S REPRESENTATIVES

The Owner’s Representative on this project will be Laurie Gardner, who is authorized to sign contracts and other legal documents related to this project on behalf of the Owner.

The Owner’s Project Manager on this project will be Lachelle Lackey.

The Owner and the Contractor hereby agree to the full performance of the covenants herein.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the day and year first above written.

UNIVERSITY OF MAINE SYSTEM
by and through
University of Maine at Farmington
Company

By: _________________________________ By: _________________________________
Laurie A. Gardner
Chief Business Officer
University of Maine at Farmington

END OF SECTION 00 52 13
PERFORMANCE BOND FORM

KNOW ALL BY THESE PRESENTS THAT (1) ________________________________
of ___________________________ and State of ________________, as PRINCIPAL, and (2) ________________________________, a corporation duly organized under the laws of the State of ________________, and having a usual place of business in ____________________________, as SURETY, are held and firmly bound unto the University of Maine System in the sum of ________________________________ Dollars ($ ________________________________), to be paid said Treasurer of the University of Maine System, or successor in office, for which payment well and truly to be made, Principal and Surety bind themselves, their heirs, executors and administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal shall promptly and faithfully perform the Contract entered into on the (4) _____________________________ day of __________________________, A.D., 20____ for the construction of (5) ________________________________, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the University of Maine System.

Signed and sealed this (4) _____________________________ day of __________________________, 20____.

WITNESSES: SIGNATURES:  
LS
LS
LS

Bonding Company Agent:

Company: ________________________________
Street: ________________________________
City, State, Zip: ________________________________
Telephone: ________________________________

(1) Correct name of Contractor.
(2) A corporation, a partnership, or an individual, as the case may be.
(3) Correct name of Surety.
(4) Same date as that of contract.
(5) Name of Project as designated in contract.

If Contractor is a partnership, all partners should execute bond. A Power of Attorney document, together with a statement that it still is in effect shall be provided by the person executing this bond. Bond must be countersigned by a Resident Maine Agent.

***DO NOT ALTER LANGUAGE***

END OF SECTION 00 61 13.13
KNOW ALL BY THESE PRESENTS THAT (1) ___________________________ and State of ___________________________, as PRINCIPAL, and (3) ___________________________ of ___________________________ and State of ___________________________, a corporation duly organized under the laws of the State of ___________________________ , and having a usual place of business in ___________________________ , as SURETY, are held and firmly bound unto the University of Maine System in the sum of $_________________________), for the use and benefit of claimants* as herein below defined, for the payment whereof Principal and Surety bind themselves, their heirs, executors and administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal shall promptly satisfy all claims and demands incurred for all labor and materials used or required by the Principal in connection with the work contemplated in the Contract entered into on the (4) _______ day of ____________________________, A.D., 20______ for the construction of (5) ___________________________ and shall fully reimburse the obligee for all outlay and expense which said obligee may incur in making good any default of said principal, then this obligation shall be null and void; otherwise, it shall remain in full force and effect.

* A Claimant is defined as one having a direct contract with the Principal or with a subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the contract.

Signed and sealed this (6) __________ day of ____________________________, 20______.

WITNESSES: SIGNATURES: LS

_________________________________________  ___________________________  LS
_________________________________________  ___________________________  LS
_________________________________________  ___________________________  LS

Bonding Company Agent:

Company: ___________________________
Street: ___________________________
City, State, Zip: ___________________________
Telephone: ___________________________

(1) Correct name of Contractor.
(2) A corporation, a partnership, or an individual, as the case may be.
(3) Correct name of Surety.
(4) Same date as that of contract.
(5) Name of Project as designated in contract.
(6) Same date as that of Contract.

If contractor is a partnership, all partners should execute bond. A Power of Attorney document, together with a statement that it still is in effect shall be provided by the person executing this bond. Bond must be countersigned by a Resident Maine Agent.

**DO NOT ALTER LANGUAGE**

END OF SECTION 00 61 13.16
**AIA® Document G715™ – 2017**

**Supplemental Attachment** for **ACORD Certificate of Insurance 25**

<table>
<thead>
<tr>
<th>PROJECT: (name and address)</th>
<th>CONTRACT INFORMATION:</th>
<th>CERTIFICATE INFORMATION:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samples</td>
<td>Contract For:</td>
<td>Producer:</td>
</tr>
<tr>
<td></td>
<td>Date:</td>
<td>Insured:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Date:</td>
</tr>
<tr>
<td>OWNER: (name and address)</td>
<td>ARCHITECT: (name and address)</td>
<td>CONTRACTOR: (name and address)</td>
</tr>
<tr>
<td>University of Maine System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>by and through</td>
<td>University of Maine at Farmington</td>
<td></td>
</tr>
<tr>
<td>224 Main Street</td>
<td>224 Main Street</td>
<td></td>
</tr>
<tr>
<td>Farmington, ME 04938</td>
<td>Farmington, ME 04938</td>
<td></td>
</tr>
</tbody>
</table>

### A. General Liability

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does this policy include coverage for:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Damages because of bodily injury, sickness, or disease, including occupational sickness or disease, and death of any person?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b</td>
<td>Personal injury and advertising injury?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c</td>
<td>Damages because of physical damage to or destruction of tangible property, including the loss of use of such property?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d</td>
<td>Bodily injury or property damage arising out of completed operations?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e</td>
<td>The Contractor’s indemnity obligations included in the Contract Documents?</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

2. Does this policy contain an exclusion or restriction of coverage for:

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Claims by one insured against another insured, where the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b</td>
<td>Claims for property damage to the Contractor’s Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>c</td>
<td>Claims for bodily injury other than to employees of the insured?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>d</td>
<td>Claims for the Contractor’s indemnity obligations included in the Contract Documents arising out of injury to employees of the insured?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>e</td>
<td>Claims for loss excluded under a prior work endorsement or other similar exclusionary language?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>f</td>
<td>Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>g</td>
<td>Claims related to residential, multi-family, or other habitational projects?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>h</td>
<td>Claims related to roofing?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>i</td>
<td>Claims related to exterior insulation finish systems, synthetic stucco, or similar exterior coatings or surfaces?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>j</td>
<td>Claims related to earth subsistence or movement?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>k</td>
<td>Claims related to explosion, collapse, and underground hazards?</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### B. Other insurance Coverage

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Indicate whether the Contractor has the following insurance coverages and, if so, indicate the coverage limits for each.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a</td>
<td>Professional liability insurance</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>b</td>
<td>Pollution liability insurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coverage limits:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c</td>
<td>Insurance for maritime liability risks associated with the operation of a vessel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coverage limits:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d</td>
<td>Insurance for the use or operation of manned or unmanned aircraft</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coverage limits:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e</td>
<td>Property insurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coverage limits:</td>
<td></td>
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<td>Insurance for physical damage to property while it is in storage and in transit to the construction site</td>
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<td>Other:</td>
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(Authorized Representative)

(Date of Issue)
## Certificate of Liability Insurance

**ACORD™ CERTIFICATE OF LIABILITY INSURANCE**

**THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFRMS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.**

### Insurers Affording Coverage

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<th>Insurer A:</th>
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<td>Insurer B:</td>
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### Coverages

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<th>Insr</th>
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<th>Type of Insurance</th>
<th>Policy Number</th>
<th>Policy Effective Date (MM/DD/YY)</th>
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**DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS**

University of Maine System is named an additional insured under General Liability.

**Project:**

### Certificate Holder

University of Maine System  
Office of Risk Management  
Robinson Hall  
46 University Drive  
Augusta, ME 04330

### Additional Insured: Insurer Letter:

**Certificate Holder:** University of Maine System  
**Additional Insured: Insurer Letter:**

**Cancellation:**

Should any of the above described policies be cancelled before the expiration date thereof, the issuing insurer will endeavor to mail ____ days written notice to the certificate holder named to the left, but failure to do so shall impose no obligation or liability of any kind upon the insurer, its agents or representatives.

**Authorized Representative:**

© ACORD CORPORATION 1998  
ACORD 25-S (7/97)  
UMF - ECEC  
00 62 16.10 - 1  
Certificate of Insurance Form
IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.
COMMERCIAL GENERAL LIABILITY COVERAGE FORM

Various provisions in this policy restrict coverage. Read the entire policy carefully to determine rights, duties and what is and is not covered.

Throughout this policy the words "you" and "your" refer to the Named Insured shown in the Declarations, and any other person or organization qualifying as a Named Insured under this policy. The words "we", "us" and "our" refer to the company providing this insurance.

The word "insured" means any person or organization qualifying as such under Section II – Who Is An Insured.

Other words and phrases that appear in quotation marks have special meaning. Refer to Section V – Definitions.

SECTION I – COVERAGE

COVERAGE A BODILY INJURY AND PROPERTY DAMAGE LIABILITY

1. Insuring Agreement

a. We will pay those sums that the insured becomes legally obligated to pay as damages because of "bodily injury" or "property damage" to which this insurance applies. We will have the right and duty to defend the insured against any "suit" seeking those damages. However, we will have no duty to defend the insured against any "suit" seeking damages for "bodily injury" or "property damage" to which this insurance does not apply. We may, at our discretion, investigate any "occurrence" and settle any claim or "suit" that may result. But:

(1) The amount we will pay for damages is limited as described in Section III – Limits Of Insurance; and

(2) Our right and duty to defend ends when we have used up the applicable limit of insurance in the payment of judgments or settlements under Coverages A or B or medical expenses under Coverage C.

No other obligation or liability to pay sums or perform acts or services is covered unless explicitly provided for under Supplementary Payments – Coverages A and B.

b. This insurance applies to "bodily injury" and "property damage" only if:

(1) The "bodily injury" or "property damage" is caused by an "occurrence" that takes place in the "coverage territory";

(2) The "bodily injury" or "property damage" occurs during the policy period; and

(3) Prior to the policy period, no insured listed under Paragraph 1. of Section II – Who Is An Insured and no "employee" authorized by you to give or receive notice of an "occurrence" or claim, knew that the "bodily injury" or "property damage" had occurred, in whole or in part. If such a listed insured or authorized "employee" knew, prior to the policy period, that the "bodily injury" or "property damage" occurred, then any continuation, change or resumption of such "bodily injury" or "property damage" during or after the policy period will be deemed to have been known prior to the policy period.

c. "Bodily injury" or "property damage" which occurs during the policy period and was not, prior to the policy period, known to have occurred by any insured listed under Paragraph 1. of Section II – Who Is An Insured or any "employee" authorized by you to give or receive notice of an "occurrence" or claim, includes any continuation, change or resumption of that "bodily injury" or "property damage" after the end of the policy period.

d. "Bodily injury" or "property damage" will be deemed to have been known to have occurred at the earliest time when any insured listed under Paragraph 1. of Section II – Who Is An Insured or any "employee" authorized by you to give or receive notice of an "occurrence" or claim:

(1) Reports all, or any part, of the "bodily injury" or "property damage" to us or any other insuer;

(2) Receives a written or verbal demand or claim for damages because of the "bodily injury" or "property damage"; or

(3) Becomes aware by any other means that "bodily injury" or "property damage" has occurred or has begun to occur.
e. Damages because of “bodily injury” include damages claimed by any person or organization for care, loss of services or death resulting at any time from the “bodily injury”.

2. Exclusions

This insurance does not apply to:

a. Expected Or Intended Injury

“Bodily injury” or “property damage” expected or intended from the standpoint of the insured. This exclusion does not apply to “bodily injury” resulting from the use of reasonable force to protect persons or property.

b. Contractual Liability

“Bodily injury” or “property damage” for which the insured is obligated to pay damages because of the assumption of liability in a contract or agreement. This exclusion does not apply to liability for damages:

(1) That the insured would have in the absence of the contract or agreement; or

(2) Assumed in a contract or agreement that is an “insured contract”, provided the “bodily injury” or “property damage” occurs subsequent to the execution of the contract or agreement. Solely for the purposes of liability assumed in an “insured contract”, reasonable attorney fees and necessary litigation expenses incurred by or for a party other than an insured are deemed to be damages because of “bodily injury” or “property damage”, provided:

(a) Liability to such party for, or for the cost of, that party’s defense has also been assumed in the same “insured contract”; and

(b) Such attorney fees and litigation expenses are for defense of that party against a civil or alternative dispute resolution proceeding in which damages to which this insurance applies are alleged.

c. Liquor Liability

“Bodily injury” or “property damage” for which any insured may be held liable by reason of:

(1) Causing or contributing to the intoxication of any person;

(2) The furnishing of alcoholic beverages to a person under the legal drinking age or under the influence of alcohol; or

(3) Any statute, ordinance or regulation relating to the sale, gift, distribution or use of alcoholic beverages.

This exclusion applies only if you are in the business of manufacturing, distributing, selling, serving or furnishing alcoholic beverages.

d. Workers’ Compensation And Similar Laws

Any obligation of the insured under a workers’ compensation, disability benefits or unemployment compensation law or any similar law.

e. Employer's Liability

“Bodily injury” to:

(1) An “employee” of the insured arising out of and in the course of:

(a) Employment by the insured; or

(b) Performing duties related to the conduct of the insured's business; or

(2) The spouse, child, parent, brother or sister of that “employee” as a consequence of Paragraph (1) above.

This exclusion applies:

(1) Whether the insured may be liable as an employer or in any other capacity; and

(2) To any obligation to share damages with or repay someone else who must pay damages because of the injury.

This exclusion does not apply to liability assumed by the insured under an “insured contract”.
f. Pollution

(1) "Bodily injury" or "property damage" arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants":

(a) At or from any premises, site or location which is or was at any time owned or occupied by, or rented or loaned to, any insured. However, this subparagraph does not apply to:

(i) "Bodily injury" if sustained within a building and caused by smoke, fumes, vapor or soot produced by or originating from equipment that is used to heat, cool or dehumidify the building, or equipment that is used to heat water for personal use, by the building's occupants or their guests;

(ii) "Bodily injury" or "property damage" for which you may be held liable, if you are a contractor and the owner or lessee of such premises, site or location has been added to your policy as an additional insured with respect to your ongoing operations performed for that additional insured at that premises, site or location and such premises, site or location is not and never was owned or occupied by, or rented or loaned to, any insured, other than that additional insured; or

(iii) "Bodily injury" or "property damage" arising out of heat, smoke or fumes from a "hostile fire";

(b) At or from any premises, site or location which is or was at any time used by or for any insured or others for the handling, storage, disposal, processing or treatment of waste;

(c) Which are or were at any time transported, handled, stored, treated, disposed of, or processed as waste by or for:

(i) Any insured; or

(ii) Any person or organization for whom you may be legally responsible; or

(d) At or from any premises, site or location on which any insured or any contractors or subcontractors working directly or indirectly on any insured's behalf are performing operations if the "pollutants" are brought on or to the premises, site or location in connection with such operations by such insured, contractor or subcontractor. However, this subparagraph does not apply to:

(i) "Bodily injury" or "property damage" arising out of the escape of fuels, lubricants or other operating fluids which are needed to perform the normal electrical, hydraulic or mechanical functions necessary for the operation of "mobile equipment" or its parts, if such fuels, lubricants or other operating fluids are brought on or to the premises, site or location with the intent that they be discharged, dispersed or released as part of the operations being performed by such insured, contractor or subcontractor;

(ii) "Bodily injury" or "property damage" sustained within a building and caused by the release of gases, fumes or vapors from materials brought into that building in connection with operations being performed by you or on your behalf by a contractor or subcontractor; or

(iii) "Bodily injury" or "property damage" arising out of heat, smoke or fumes from a "hostile fire".

(e) At or from any premises, site or location on which any insured or any contractors or subcontractors working directly or indirectly on any insured’s behalf are performing operations if the operations are to test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants".
(2) Any loss, cost or expense arising out of any:
   (a) Request, demand, order or statutory or regulatory requirement that any insured or others test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants"; or
   (b) Claim or "suit" by or on behalf of a governmental authority for damages because of testing for, monitoring, cleaning up, removing, containing, treating, detoxifying or neutralizing, or in any way responding to, or assessing the effects of, "pollutants".

However, this paragraph does not apply to liability for damages because of "property damage" that the insured would have in the absence of such request, demand, order or statutory or regulatory requirement, or such claim or "suit" by or on behalf of a governmental authority.

h. Mobile Equipment
"Bodily injury" or "property damage" arising out of:
(1) The transportation of "mobile equipment" by an "auto" owned or operated by or rented or loaned to any insured; or
(2) The use of "mobile equipment" in, or while in practice for, or while being prepared for, any prearranged racing, speed, demolition, or stunting activity.

i. War
"Bodily injury" or "property damage", however caused, arising, directly or indirectly, out of:
(1) War, including undeclared or civil war;
(2) Warlike action by a military force, including action in hindering or defending against an actual or expected attack, by any government, sovereign or other authority using military personnel or other agents; or
(3) Insurrection, rebellion, revolution, usurped power, or action taken by governmental authority in hindering or defending against any of these.

j. Damage To Property
"Property damage" to:
(1) Property you own, rent, or occupy, including any costs or expenses incurred by you, or any other person, organization or entity, for repair, replacement, enhancement, restoration or maintenance of such property for any reason, including prevention of injury to a person or damage to another's property;
(2) Premises you sell, give away or abandon, if the "property damage" arises out of any part of those premises;
(3) Property loaned to you;
(4) Personal property in the care, custody or control of the insured;
(5) That particular part of real property on which you or any contractors or subcontractors working directly or indirectly on your behalf are performing operations, if the "property damage" arises out of those operations; or

(6) That particular part of any property that must be restored, repaired or replaced because "your work" was incorrectly performed on it.

Paragraphs (1), (3) and (4) of this exclusion do not apply to "property damage" (other than damage by fire) to premises, including the contents of such premises, rented to you for a period of 7 or fewer consecutive days. A separate limit of insurance applies to Damage To Premises Rented To You as described in Section III – Limits Of Insurance.

Paragraph (2) of this exclusion does not apply if the premises are "your work" and were never occupied, rented or held for rental by you.

Paragraphs (3), (4), (5) and (6) of this exclusion do not apply to liability assumed under a side-track agreement.

Paragraph (6) of this exclusion does not apply to "property damage" included in the "products-completed operations hazard".

k. Damage To Your Product

"Property damage" to "your product" arising out of it or any part of it.

l. Damage To Your Work

"Property damage" to "your work" arising out of it or any part of it and included in the "products-completed operations hazard".

This exclusion does not apply if the damaged work or the work out of which the damage arises was performed on your behalf by a subcontractor.

m. Damage To Impaired Property Or Property Not Physically Injured

"Property damage" to "impaired property" or property that has not been physically injured, arising out of:

(1) A defect, deficiency, inadequacy or dangerous condition in "your product" or "your work"; or

(2) A delay or failure by you or anyone acting on your behalf to perform a contract or agreement in accordance with its terms.

This exclusion does not apply to the loss of use of other property arising out of sudden and accidental physical injury to "your product" or "your work" after it has been put to its intended use.

n. Recall Of Products, Work Or Impaired Property

Damages claimed for any loss, cost or expense incurred by you or others for the loss of use, withdrawal, recall, inspection, repair, replacement, adjustment, removal or disposal of:

(1) "Your product";

(2) "Your work";

(3) "Impaired property";

if such product, work, or property is withdrawn or recalled from the market or from use by any person or organization because of a known or suspected defect, deficiency, inadequacy or dangerous condition in it.

o. Personal And Advertising Injury

"Bodily injury" arising out of "personal and advertising injury".

p. Electronic Data

Damages arising out of the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data.

As used in this exclusion, electronic data means information, facts or programs stored as or on, created or used on, or transmitted to or from computer software, including systems and applications software, hard or floppy disks, CD-ROMs, tapes, drives, cells, data processing devices or any other media which are used with electronically controlled equipment.

Exclusions c. through n. do not apply to damage by fire to premises while rented to you or temporarily occupied by you with permission of the owner. A separate limit of insurance applies to this coverage as described in Section III – Limits Of Insurance.

COVERAGE B PERSONAL AND ADVERTISING INJURY LIABILITY

1. Insuring Agreement

a. We will pay those sums that the insured becomes legally obligated to pay as damages because of "personal and advertising injury" to which this insurance applies. We will have the right and duty to defend the insured against any "suit" seeking those damages. However, we will have no duty to defend the insured against any "suit" seeking damages for "personal and advertising injury" to which this insurance does not apply. We may, at our discretion, investigate any offense and settle any claim or "suit" that may result. But:

(1) The amount we will pay for damages is limited as described in Section III – Limits Of Insurance; and
(2) Our right and duty to defend end when we have used up the applicable limit of insurance in the payment of judgments or settlements under Coverages A or B or medical expenses under Coverage C.

No other obligation or liability to pay sums or perform acts or services is covered unless explicitly provided for under Supplementary Payments – Coverages A and B.

b. This insurance applies to "personal and advertising injury" caused by an offense arising out of your business but only if the offense was committed in the "coverage territory" during the policy period.

2. Exclusions

This insurance does not apply to:

a. **Knowing Violation Of Rights Of Another**
   "Personal and advertising injury" caused by or at the direction of the insured with the knowledge that the act would violate the rights of another and would inflict "personal and advertising injury".

b. **Material Published With Knowledge Of Falsity**
   "Personal and advertising injury" arising out of oral or written publication of material, if done by or at the direction of the insured with knowledge of its falsity.

c. **Material Published Prior To Policy Period**
   "Personal and advertising injury" arising out of oral or written publication of material whose first publication took place before the beginning of the policy period.

d. **Criminal Acts**
   "Personal and advertising injury" arising out of a criminal act committed by or at the direction of the insured.

e. **Contractual Liability**
   "Personal and advertising injury" for which the insured has assumed liability in a contract or agreement. This exclusion does not apply to liability for damages that the insured would have in the absence of the contract or agreement.

f. **Breach Of Contract**
   "Personal and advertising injury" arising out of a breach of contract, except an implied contract to use another's advertising idea in your "advertisement".

g. **Quality Or Performance Of Goods – Failure To Conform To Statements**
   "Personal and advertising injury" arising out of the failure of goods, products or services to conform with any statement of quality or performance made in your "advertisement".

h. **Wrong Description Of Prices**
   "Personal and advertising injury" arising out of the wrong description of the price of goods, products or services stated in your "advertisement".

i. **Infringement Of Copyright, Patent, Trademark Or Trade Secret**
   "Personal and advertising injury" arising out of the infringement of copyright, patent, trademark, trade secret or other intellectual property rights.

   However, this exclusion does not apply to infringement, in your "advertisement", of copyright, trade dress or slogan.

j. **Insureds In Media And Internet Type Businesses**
   "Personal and advertising injury" committed by an insured whose business is:
   (1) Advertising, broadcasting, publishing or telecasting;
   (2) Designing or determining content of websites for others; or
   (3) An Internet search, access, content or service provider.

   However, this exclusion does not apply to Paragraphs 14.a., b. and c. of "personal and advertising injury" under the Definitions Section.

   For the purposes of this exclusion, the placing of frames, borders or links, or advertising, for you or others anywhere on the Internet, is not by itself, considered the business of advertising, broadcasting, publishing or telecasting.

k. **Electronic Chatrooms Or Bulletin Boards**
   "Personal and advertising injury" arising out of an electronic chatroom or bulletin board the insured hosts, owns, or over which the insured exercises control.

l. **Unauthorized Use Of Another's Name Or Product**
   "Personal and advertising injury" arising out of the unauthorized use of another's name or product in your e-mail address, domain name or metatag, or any other similar tactics to mislead another's potential customers.
m. Pollution
"Personal and advertising injury" arising out of the actual, alleged or threatened discharge, dispersal, seepage, migration, release or escape of "pollutants" at any time.

n. Pollution-Related
Any loss, cost or expense arising out of any:
(1) Request, demand, order or statutory or regulatory requirement that any insured or others test for, monitor, clean up, remove, contain, treat, detoxify or neutralize, or in any way respond to, or assess the effects of, "pollutants"; or
(2) Claim or suit by or on behalf of a governmental authority for damages because of testing for, monitoring, cleaning up, removing, containing, treating, detoxifying or neutralizing, or in any way responding to, or assessing the effects of, "pollutants".

o. War
"Personal and advertising injury", however caused, arising, directly or indirectly, out of:
(1) War, including undeclared or civil war;
(2) Warlike action by a military force, including action in hindering or defending against an actual or expected attack, by any government, sovereign or other authority using military personnel or other agents; or
(3) Insurrection, rebellion, revolution, usurped power, or action taken by governmental authority in hindering or defending against any of these.

COVERAGE C MEDICAL PAYMENTS
1. Insuring Agreement
   a. We will pay medical expenses as described below for "bodily injury" caused by an accident:
      (1) On premises you own or rent;
      (2) On ways next to premises you own or rent; or
      (3) Because of your operations; provided that:
      (1) The accident takes place in the "coverage territory" and during the policy period;
      (2) The expenses are incurred and reported to us within one year of the date of the accident; and
      (3) The injured person submits to examination, at our expense, by physicians of our choice as often as we reasonably require.
   b. We will make these payments regardless of fault. These payments will not exceed the applicable limit of insurance. We will pay reasonable expenses for:
      (1) First aid administered at the time of an accident;
      (2) Necessary medical, surgical, x-ray and dental services, including prosthetic devices; and
      (3) Necessary ambulance, hospital, professional nursing and funeral services.

2. Exclusions
We will not pay expenses for "bodily injury":
   a. Any Insured
      To any insured, except "volunteer workers".
   b. Hired Person
      To a person hired to do work for or on behalf of any insured or a tenant of any insured.
   c. Injury On Normally Occupied Premises
      To a person injured on that part of premises you own or rent that the person normally occupies.
   d. Workers Compensation And Similar Laws
      To a person, whether or not an "employee" of any insured, if benefits for the "bodily injury" are payable or must be provided under a workers' compensation or disability benefits law or a similar law.
   e. Athletics Activities
      To a person injured while practicing, instructing or participating in any physical exercises or games, sports, or athletic contests.
   f. Products-Completed Operations Hazard
      Included within the "products-completed operations hazard".
   g. Coverage A Exclusions
      Excluded under Coverage A.

SUPPLEMENTARY PAYMENTS – COVERAGES A AND B
1. We will pay, with respect to any claim we investigate or settle, or any "suit" against an insured we defend:
   a. All expenses we incur.
   b. Up to $250 for cost of bail bonds required because of accidents or traffic law violations arising out of the use of any vehicle to which the Bodily Injury Liability Coverage applies. We do not have to furnish these bonds.
c. The cost of bonds to release attachments, but only for bond amounts within the applicable limit of insurance. We do not have to furnish these bonds.

d. All reasonable expenses incurred by the insured at our request to assist us in the investigation or defense of the claim or "suit", including actual loss of earnings up to $250 a day because of time off from work.

e. All costs taxed against the insured in the "suit".

f. Prejudgment interest awarded against the insured on that part of the judgment we pay. If we make an offer to pay the applicable limit of insurance, we will not pay any prejudgment interest based on that period of time after the offer.

g. All interest on the full amount of any judgment that accrues after entry of the judgment and before we have paid, offered to pay, or deposited in court the part of the judgment that is within the applicable limit of insurance.

These payments will not reduce the limits of insurance.

2. If we defend an insured against a "suit" and an indemnitee of the insured is also named as a party to the "suit", we will defend that indemnitee if all of the following conditions are met:

a. The "suit" against the indemnitee seeks damages for which the insured has assumed the liability of the indemnitee in a contract or agreement that is an "insured contract";

b. This insurance applies to such liability assumed by the insured;

c. The obligation to defend, or the cost of the defense of, that indemnitee, has also been assumed by the insured in the same "insured contract";

d. The allegations in the "suit" and the information we know about the "occurrence" are such that no conflict appears to exist between the interests of the insured and the interests of the indemnitee;

e. The indemnitee and the insurer ask us to conduct and control the defense of that indemnitee against such "suit" and agree that we can assign the same counsel to defend the insured and the indemnitee; and

f. The indemnitee:

   (1) Agrees in writing to:

   (a) Cooperate with us in the investigation, settlement or defense of the "suit";
   
   (b) Immediately send us copies of any demands, notices, summonses or legal papers received in connection with the "suit";
   
   (c) Notify any other insurer whose coverage is available to the indemnitee; and
   
   (d) Cooperate with us with respect to coordinating other applicable insurance available to the indemnitee; and

2) Provides us with written authorization to:

   (a) Obtain records and other information related to the "suit"; and
   
   (b) Conduct and control the defense of the indemnitee in such "suit".

So long as the above conditions are met, attorneys' fees incurred by us in the defense of that indemnitee, necessary litigation expenses incurred by us and necessary litigation expenses incurred by the indemnitee at our request will be paid as Supplementary Payments. Notwithstanding the provisions of Paragraph 2.b (2) of Section I – Coverage A – Bodily Injury And Property Damage Liability, such payments will not be deemed to be damages for "bodily injury" and "property damage" and will not reduce the limits of insurance.

Our obligation to defend an insured's indemnitee and to pay for attorneys' fees and necessary litigation expenses as Supplementary Payments ends when:

a. We have used up the applicable limit of insurance in the payment of judgments or settlements; or

b. The conditions set forth above, or the terms of the agreement described in Paragraph f. above, are no longer met.

SECTION II – WHO IS AN INSURED

1. If you are designated in the Declarations as:

a. An individual, you and your spouse are insured, but only with respect to the conduct of a business of which you are the sole owner.

b. A partnership or joint venture, you are an insured. Your members, your partners, and their spouses are also insureds, but only with respect to the conduct of your business.

c. A limited liability company, you are an insured. Your members are also insureds, but only with respect to their duties as your managers.
d. An organization other than a partnership, joint venture or limited liability company, you are an insured. Your "executive officers" and directors are insureds, but only with respect to their duties as your officers or directors. Your stockholders are also insureds, but only with respect to their liability as stockholders.

e. A trust, you are an insured. Your trustees are also insureds, but only with respect to their duties as trustees.

2. Each of the following is also an insured:

a. Your "volunteer workers" only while performing duties related to the conduct of your business, or your "employees", other than either your "executive officers" (if you are an organization other than a partnership, joint venture or limited liability company) or your managers (if you are a limited liability company), but only for acts within the scope of their employment by you or while performing duties related to the conduct of your business. However, none of these "employees" or "volunteer workers" are insureds for:

   (1) "Bodily injury" or "personal and advertising injury":

   (a) To you, to your partners or members (if you are a partnership or joint venture), to your members (if you are a limited liability company), to a co-"employee" while in the course of his or her employment or performing duties related to the conduct of your business, or to your other "volunteer workers" while performing duties related to the conduct of your business;

   (b) To the spouse, child, parent, brother or sister of that co-"employee" or "volunteer worker" as a consequence of Paragraph (1)(a) above;

   (c) For which there is any obligation to share damages with or repay someone else who must pay damages because of the injury described in Paragraphs (1)(a) or (b) above; or

   (d) Arising out of his or her providing or failing to provide professional health care services.

(2) "Property damage" to property:

   (a) Owned, occupied or used by,

   (b) Rented to, in the care, custody or control of, or over which physical control is being exercised for any purpose by you, any of your "employees", "volunteer workers", any partner or member (if you are a partnership or joint venture), or any member (if you are a limited liability company).

b. Any person (other than your "employee" or "volunteer worker"), or any organization while acting as your real estate manager.

c. Any person or organization having proper temporary custody of your property if you die, but only:

   (1) With respect to liability arising out of the maintenance or use of that property; and

   (2) Until your legal representative has been appointed.

d. Your legal representative if you die, but only with respect to duties as such. That representative will have all your rights and duties under this Coverage Part.

3. Any organization you newly acquire or form, other than a partnership, joint venture or limited liability company, and over which you maintain ownership or majority interest, will qualify as a Named Insured if there is no other similar insurance available to that organization. However:

a. Coverage under this provision is afforded only until the 90th day after you acquire or form the organization or the end of the policy period, whichever is earlier;

b. Coverage A does not apply to "bodily injury" or "property damage" that occurred before you acquired or formed the organization; and

c. Coverage B does not apply to "personal and advertising injury" arising out of an offense committed before you acquired or formed the organization.

No person or organization is an insured with respect to the conduct of any current or past partnership, joint venture or limited liability company that is not shown as a Named Insured in the Declarations.

SECTION III – LIMITS OF INSURANCE

1. The Limits of Insurance shown in the Declarations and the rules below fix the most we will pay regardless of the number of:

   a. Insureds;

   b. Claims made or "suits" brought; or

   c. Persons or organizations making claims or bringing "suits".
2. The General Aggregate Limit is the most we will pay for the sum of:
   a. Medical expenses under Coverage C;
   b. Damages under Coverage A, except damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard"; and
   c. Damages under Coverage B.
3. The Products-Completed Operations Aggregate Limit is the most we will pay under Coverage A for damages because of "bodily injury" and "property damage" included in the "products-completed operations hazard".
4. Subject to 2. above, the Personal and Advertising Injury Limit is the most we will pay under Coverage B for the sum of all damages because of all "personal and advertising injury" sustained by any one person or organization.
5. Subject to 2. or 3. above, whichever applies, the Each Occurrence Limit is the most we will pay for the sum of:
   a. Damages under Coverage A; and
   b. Medical expenses under Coverage C because of all "bodily injury" and "property damage" arising out of any one "occurrence".
6. Subject to 5. above, the Damage To Premises Rented To You Limit is the most we will pay under Coverage A for damages because of "property damage" to any one premises, while rented to you, or in the case of damage by fire, while rented to you or temporarily occupied by you with permission of the owner.
7. Subject to 5. above, the Medical Expense Limit is the most we will pay under Coverage C for all medical expenses because of "bodily injury" sustained by any one person.

The Limits of Insurance of this Coverage Part apply separately to each consecutive annual period and to any remaining period of less than 12 months, starting with the beginning of the policy period shown in the Declarations, unless the policy period is extended after issuance for an additional period of less than 12 months. In that case, the additional period will be deemed part of the last preceding period for purposes of determining the Limits of Insurance.

SECTION IV – COMMERCIAL GENERAL LIABILITY CONDITIONS

1. Bankruptcy
   Bankruptcy or insolvency of the insured or of the insured's estate will not relieve us of our obligations under this Coverage Part.

2. Duties In The Event Of Occurrence, Offense, Claim Or Suit
   a. You must see to it that we are notified as soon as practicable of an "occurrence" or an offense which may result in a claim. To the extent possible, notice should include:
      (1) How, when and where the "occurrence" or offense took place;
      (2) The names and addresses of any injured persons and witnesses; and
      (3) The nature and location of any injury or damage arising out of the "occurrence" or offense.
   b. If a claim is made or "suit" is brought against any insured, you must:
      (1) Immediately record the specifics of the claim or "suit" and the date received; and
      (2) Notify us as soon as practicable.
   c. You and any other involved insured must:
      (1) Immediately send us copies of any demands, notices, summonses or legal papers received in connection with the claim or "suit";
      (2) Authorize us to obtain records and other information;
      (3) Cooperate with us in the investigation or settlement of the claim or defense against the "suit"; and
      (4) Assist us, upon our request, in the enforcement of any right against any person or organization which may be liable to the insured because of injury or damage to which this insurance may also apply.
   d. No insured will, except at that insured's own cost, voluntarily make a payment, assume any obligation, or incur any expense, other than for first aid, without our consent.
3. Legal Action Against Us
   No person or organization has a right under this Coverage Part:
   a. To join us as a party or otherwise bring us into a "suit" asking for damages from an insured; or
b. To sue us on this Coverage Part unless all of its terms have been fully complied with.

A person or organization may sue us to recover on an agreed settlement or on a final judgment against an insured; but we will not be liable for damages that are not payable under the terms of this Coverage Part or that are in excess of the applicable limit of insurance. An agreed settlement means a settlement and release of liability signed by us, the insured and the claimant or the claimant's legal representative.

4. Other Insurance

If other valid and collectible insurance is available to the insured for a loss we cover under Coverages A or B of this Coverage Part, our obligations are limited as follows:

a. Primary Insurance

This insurance is primary except when b. below applies. If this insurance is primary, our obligations are not affected unless any of the other insurance is also primary. Then, we will share with all that other insurance by the method described in c. below.

b. Excess Insurance

This insurance is excess over:

(1) Any of the other insurance, whether primary, excess, contingent or on any other basis:
   
   (a) That is Fire, Extended Coverage, Builder's Risk, Installation Risk or similar coverage for "your work";
   
   (b) That is Fire insurance for premises rented to you or temporarily occupied by you with permission of the owner;
   
   (c) That is insurance purchased by you to cover your liability as a tenant for "property damage" to premises rented to you or temporarily occupied by you with permission of the owner;
   
   (d) If the loss arises out of the maintenance or use of aircraft, "autos" or watercraft to the extent not subject to Exclusion g. of Section I – Coverage A – Bodily Injury And Property Damage Liability.

(2) Any other primary insurance available to you covering liability for damages arising out of the premises or operations, or the products and completed operations, for which you have been added as an additional insured by attachment of an endorsement.

When this insurance is excess, we will have no duty under Coverages A or B to defend the insured against any "suit" if any other insurer has a duty to defend the insured against that "suit". If no other insurer defends, we will undertake to do so, but we will be entitled to the insured's rights against all those other insurers.

When this insurance is excess over other insurance, we will pay only our share of the amount of the loss, if any, that exceeds the sum of:

(1) The total amount that all such other insurance would pay for the loss in the absence of this insurance; and

(2) The total of all deductible and self-insured amounts under all that other insurance.

We will share the remaining loss, if any, with any other insurance that is not described in this Excess Insurance provision and was not bought specifically to apply in excess of the Limits of Insurance shown in the Declarations of this Coverage Part.

c. Method Of Sharing

If all of the other insurance permits contribution by equal shares, we will follow this method also. Under this approach each insurer contributes equal amounts until it has paid its applicable limit of insurance or none of the loss remains, whichever comes first.

If any of the other insurance does not permit contribution by equal shares, we will contribute by limits. Under this method, each insurer's share is based on the ratio of its applicable limit of insurance to the total applicable limits of insurance of all insurers.

5. Premium Audit

a. We will compute all premiums for this Coverage Part in accordance with our rules and rates.

b. Premium shown in this Coverage Part as advance premium is a deposit premium only. At the close of each audit period we will compute the earned premium for that period and send notice to the first Named Insured. The due date for audit and retrospective premiums is the date shown as the due date on the bill. If the sum of the advance and audit premiums paid for the policy period is greater than the earned premium, we will return the excess to the first Named Insured.

c. The first Named Insured must keep records of the information we need for premium computation, and send us copies at such times as we may request.
6. Representations
By accepting this policy, you agree:

a. The statements in the Declarations are accurate and complete;

b. Those statements are based upon representations you made to us; and

c. We have issued this policy in reliance upon your representations.

7. Separation Of Insureds
Except with respect to the Limits of Insurance, and any rights or duties specifically assigned in this Coverage Part to the first Named Insured, this insurance applies:

a. As if each Named Insured were the only Named Insured; and

b. Separately to each insured against whom claim is made or "suit" is brought.

8. Transfer Of Rights Of Recovery Against Others To Us
If the insured has rights to recover all or part of any payment we have made under this Coverage Part, those rights are transferred to us. The insured must do nothing after loss to impair them. At our request, the insured will bring "suit" or transfer those rights to us and help us enforce them.

9. When We Do Not Renew
If we decide not to renew this Coverage Part, we will mail or deliver to the first Named Insured shown in the Declarations written notice of the non-renewal not less than 30 days before the expiration date.

If notice is mailed, proof of mailing will be sufficient proof of notice.

SECTION V – DEFINITIONS
1. "Advertisement" means a notice that is broadcast or published to the general public or specific market segments about your goods, products or services for the purpose of attracting customers or supporters. For the purposes of this definition:

a. Notices that are published include material placed on the Internet or on similar electronic means of communication; and

b. Regarding web-sites, only that part of a web-site that is about your goods, products or services for the purposes of attracting customers or supporters is considered an advertisement.

2. "Auto" means:

a. A land motor vehicle, trailer or semitrailer designed for travel on public roads, including any attached machinery or equipment; or

b. Any other land vehicle that is subject to a compulsory or financial responsibility law or other motor vehicle insurance law in the state where it is licensed or principally garaged.

However, "auto" does not include "mobile equipment".

3. "Bodily injury" means bodily injury, sickness or disease sustained by a person, including death resulting from any of these at any time.

4. "Coverage territory" means:

a. The United States of America (including its territories and possessions), Puerto Rico and Canada;

b. International waters or airspace, but only if the injury or damage occurs in the course of travel or transportation between any places included in a. above; or

c. All other parts of the world if the injury or damage arises out of:

(1) Goods or products made or sold by you in the territory described in a. above;

(2) The activities of a person whose home is in the territory described in a. above, but is away for a short time on your business; or

(3) "Personal and advertising injury" offenses that take place through the Internet or similar electronic means of communication provided the insured's responsibility to pay damages is determined in a "suit" on the merits, in the territory described in a. above or in a settlement we agree to.

5. "Employee" includes a "leased worker". "Employee" does not include a "temporary worker".

6. "Executive officer" means a person holding any of the officer positions created by your charter, constitution, by-laws or any other similar governing document.

7. "Hostile fire" means one which becomes uncontrollable or breaks out from where it was intended to be.

8. "Impaired property" means tangible property, other than "your product" or "your work", that cannot be used or is less useful because:

a. It incorporates "your product" or "your work" that is known or thought to be defective, deficient, inadequate or dangerous; or

b. You have failed to fulfill the terms of a contract or agreement;

if such property can be restored to use by:

a. The repair, replacement, adjustment or removal of "your product" or "your work"; or
b. Your fulfilling the terms of the contract or agreement.

9. "Insured contract" means:
   a. A contract for a lease of premises. However, that portion of the contract for a lease of premises that indemnifies any person or organization for damage by fire to premises while rented to you or temporarily occupied by you with permission of the owner is not an "insured contract";
   b. A sidetrack agreement;
   c. Any easement or license agreement, except in connection with construction or demolition operations on or within 50 feet of a railroad;
   d. An obligation, as required by ordinance, to indemnify a municipality, except in connection with work for a municipality;
   e. An elevator maintenance agreement;
   f. That part of any other contract or agreement pertaining to your business (including an indemnification of a municipality in connection with work performed for a municipality) under which you assume the tort liability of another party to pay for "bodily injury" or "property damage" to a third person or organization. Tort liability means a liability that would be imposed by law in the absence of any contract or agreement.

Paragraph f. does not include that part of any contract or agreement:

(1) That indemnifies a railroad for "bodily injury" or "property damage" arising out of construction or demolition operations, within 50 feet of any railroad property and affecting any railroad bridge or trestle, tracks, roadbeds, tunnel, underpass or crossing;
(2) That indemnifies an architect, engineer or surveyor for injury or damage arising out of:
   a) Preparing, approving, or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; or
   b) Giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage; or
(3) Under which the insured, if an architect, engineer or surveyor, assumes liability for an injury or damage arising out of the insured's rendering or failure to render professional services, including those listed in (2) above and supervisory, inspection, architectural or engineering activities.

10. "Leased worker" means a person leased to you by a labor leasing firm under an agreement between you and the labor leasing firm, to perform duties related to the conduct of your business. "Leased worker" does not include a "temporary worker".

11. "Loading or unloading" means the handling of property:
   a. After it is moved from the place where it is accepted for movement into or onto an aircraft, watercraft or "auto";
   b. While it is in or on an aircraft, watercraft or "auto"; or
   c. While it is being moved from an aircraft, watercraft or "auto" to the place where it is finally delivered; but "loading or unloading" does not include the movement of property by means of a mechanical device, other than a hand truck, that is not attached to the aircraft, watercraft or "auto".

12. "Mobile equipment" means any of the following types of land vehicles, including any attached machinery or equipment:
   a. Bulldozers, farm machinery, forklifts and other vehicles designed for use principally off public roads;
   b. Vehicles maintained for use solely on or next to premises you own or rent;
   c. Vehicles that travel on crawler treads;
   d. Vehicles, whether self-propelled or not, maintained primarily to provide mobility to permanently mounted:
      (1) Power cranes, shovels, loaders, diggers or drills; or
      (2) Road construction or resurfacing equipment such as graders, scrapers or rollers;
   e. Vehicles not described in a., b., c. or d. above that are not self-propelled and are maintained primarily to provide mobility to permanently attached equipment of the following types:
      (1) Air compressors, pumps and generators, including spraying, welding, building cleaning, geophysical exploration, lighting and well servicing equipment; or
      (2) Cherry pickers and similar devices used to raise or lower workers;
   f. Vehicles not described in a., b., c. or d. above maintained primarily for purposes other than the transportation of persons or cargo.

However, self-propelled vehicles with the following types of permanently attached equipment are not "mobile equipment" but will be considered "autos":
(1) Equipment designed primarily for:
(a) Snow removal;
(b) Road maintenance, but not construction or resurfacing; or
(c) Street cleaning;
(2) Cherry pickers and similar devices mounted on automobile or truck chassis and used to raise or lower workers; and
(3) Air compressors, pumps and generators, including spraying, welding, building cleaning, geophysical exploration, lighting and well servicing equipment.

However, "mobile equipment" does not include any land vehicles that are subject to a compulsory or financial responsibility law or other motor vehicle insurance law in the state where it is licensed or principally garaged. Land vehicles subject to a compulsory or financial responsibility law or other motor vehicle insurance law are considered "autos".

13. "Occurrence" means an accident, including continuous or repeated exposure to substantially the same general harmful conditions.

14. "Personal and advertising injury" means injury, including consequential "bodily injury", arising out of one or more of the following offenses:
a. False arrest, detention or imprisonment;
b. Malicious prosecution;
c. The wrongful eviction from, wrongful entry into, or invasion of the right of private occupancy of a room, dwelling or premises that a person occupies, committed by or on behalf of its owner, landlord or lessor;
d. Oral or written publication, in any manner, of material that slanders or libels a person or organization or disparages a person's or organization's goods, products or services;
e. Oral or written publication, in any manner, of material that violates a person's right of privacy;
f. The use of another's advertising idea in your "advertisement";
g. Infringing upon another's copyright, trade dress or slogan in your "advertisement".

15. "Pollutants" mean any solid, liquid, gaseous or thermal irritant or contaminant, including smoke, vapor, soot, fumes, acids, alkalis, chemicals and waste. Waste includes materials to be recycled, reconditioned or reclaimed.

16. "Products-completed operations hazard":
a. Includes all "bodily injury" and "property damage" occurring away from premises you own or rent and arising out of "your product" or "your work" except:
   (1) Products that are still in your physical possession; or
   (2) Work that has not yet been completed or abandoned. However, "your work" will be deemed completed at the earliest of the following times:
      (a) When all of the work called for in your contract has been completed.
      (b) When all of the work to be done at the job site has been completed if your contract calls for work at more than one job site.
      (c) When that part of the work done at a job site has been put to its intended use by any person or organization other than another contractor or subcontractor working on the same project.

   Work that may need service, maintenance, correction, repair or replacement, but which is otherwise complete, will be treated as completed.
b. Does not include "bodily injury" or "property damage" arising out of:
   (1) The transportation of property, unless the injury or damage arises out of a condition in or on a vehicle not owned or operated by you, and that condition was created by the "loading or unloading" of that vehicle by any insured;
   (2) The existence of tools, uninstalled equipment or abandoned or unused materials; or
   (3) Products or operations for which the classification, listed in the Declarations or in a policy schedule, states that products-completed operations are subject to the General Aggregate Limit.

17. "Property damage" means:
a. Physical injury to tangible property, including all resulting loss of use of that property. All such loss of use shall be deemed to occur at the time of the physical injury that caused it; or
b. Loss of use of tangible property that is not physically injured. All such loss of use shall be deemed to occur at the time of the "occurrence" that caused it.

For the purposes of this insurance, electronic data is not tangible property.

As used in this definition, electronic data means information, facts or programs stored as or on, created or used on, or transmitted to or from computer software, including systems and applications software, hard or floppy disks, CD-ROMS, tapes, drives, cells, data processing devices or any other media which are used with electronically controlled equipment.

18. "Suit" means a civil proceeding in which damages because of "bodily injury", "property damage" or "personal and advertising injury" to which this insurance applies are alleged. "Suit" includes:
   a. An arbitration proceeding in which such damages are claimed and to which the insured must submit or does submit with our consent; or
   b. Any other alternative dispute resolution proceeding in which such damages are claimed and to which the insured submits with our consent.

19. "Temporary worker" means a person who is furnished to you to substitute for a permanent "employee" on leave or to meet seasonal or short-term workload conditions.

20. "Volunteer worker" means a person who is not your "employee", and who donates his or her work and acts at the direction of and within the scope of duties determined by you, and is not paid a fee, salary or other compensation by you or anyone else for their work performed for you.

21. "Your product":
   a. Means:
      (1) Any goods or products, other than real property, manufactured, sold, handled, distributed or disposed of by:
         (a) You;
         (b) Others trading under your name; or
         (c) A person or organization whose business or assets you have acquired; and
      (2) Containers (other than vehicles), materials, parts or equipment furnished in connection with such goods or products.
   b. Includes
      (1) Warranties or representations made at any time with respect to the fitness, quality, durability, performance or use of "your product"; and
      (2) The providing of or failure to provide warnings or instructions.
   c. Does not include vending machines or other property rented to or located for the use of others but not sold.

22. "Your work":
   a. Means:
      (1) Work or operations performed by you or on your behalf; and
      (2) Materials, parts or equipment furnished in connection with such work or operations.
   b. Includes
      (1) Warranties or representations made at any time with respect to the fitness, quality, durability, performance or use of "your work", and
      (2) The providing of or failure to provide warnings or instructions.
POLICY NUMBER: 00 62 16.12

COMMERCIAL GENERAL LIABILITY
CG 20 10 07 04

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

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<thead>
<tr>
<th>Name Of Additional Insured Person(s) Or Organization(s):</th>
<th>Location(s) Of Covered Operations</th>
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Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

A. Section II – Who is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured(s) at the location(s) designated above.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

END OF SECTION 00 62 16.12
THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

<table>
<thead>
<tr>
<th>Name Of Additional Insured Person(s) Or Organization(s):</th>
<th>Location And Description Of Completed Operations</th>
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</table>

Information required to complete this Schedule, if not shown above, will be shown in the Declarations.

Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

END OF SECTION 00 62 16.13
DESIGNATED LOCATION(S)
GENERAL AGGREGATE LIMIT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Designated Location(s):

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

A. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under COVERAGE A (SECTION I), and for all medical expenses caused by accidents under COVERAGE C (SECTION I), which can be attributed only to operations at a single designated "location" shown in the Schedule above:

1. A separate Designated Location General Aggregate Limit applies to each designated "location", and that limit is equal to the amount of the General Aggregate Limit shown in the Declarations.

2. The Designated Location General Aggregate Limit is the most we will pay for the sum of all damages under COVERAGE A, except damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard", and for medical expenses under COVERAGE C regardless of the number of:
   a. Insureds;
   b. Claims made or "suits" brought; or
   c. Persons or organizations making claims or bringing "suits".

3. Any payments made under COVERAGE A for damages or under COVERAGE C for medical expenses shall reduce the Designated Location General Aggregate Limit for that designated "location". Such payments shall not reduce the General Aggregate Limit shown in the Declarations nor shall they reduce any other Designated Location General Aggregate Limit for any other designated "location" shown in the Schedule above.

4. The limits shown in the Declarations for Each Occurrence, Fire Damage and Medical Expense continue to apply. However, instead of being subject to the General Aggregate Limit shown in the Declarations, such limits will be subject to the applicable Designated Location General Aggregate Limit.
B. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under COVERAGE A (SECTION I), and for all medical expenses caused by accidents under COVERAGE C (SECTION I), which cannot be attributed only to operations at a single designated "location" shown in the Schedule above:

1. Any payments made under COVERAGE A for damages or under COVERAGE C for medical expenses shall reduce the amount available under the General Aggregate Limit or the Products-Completed Operations Aggregate Limit, whichever is applicable; and
2. Such payments shall not reduce any Designated Location General Aggregate Limit.

C. When coverage for liability arising out of the "products-completed operations hazard" is provided, any payments for damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard" will reduce the Products-Completed Operations Aggregate Limit, and not reduce the General Aggregate Limit nor the Designated Location General Aggregate Limit.

D. For the purposes of this endorsement, the Definitions Section is amended by the addition of the following definition:

"Location" means premises involving the same or connecting lots, or premises whose connection is interrupted only by a street, roadway, waterway or right-of-way of a railroad.

E. The provisions of Limits Of Insurance (SECTION III) not otherwise modified by this endorsement shall continue to apply as stipulated.

END OF SECTION 00 62 16.14
# Continuation Sheet

AIA Document G703®, Application and Certification for Payment, or G732™, Application and Certificate for Payment, Construction Manager as Adviser Edition, containing Contractor's signed certification is attached. Use Column I on Contracts where variable retainage for line items may apply.

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>DESCRIPTION OF WORK</th>
<th>SCHEDULED VALUE</th>
<th>WORK COMPLETED FROM PREVIOUS APPLICATION (D + E)</th>
<th>THIS PERIOD</th>
<th>MATERIALS PRESENTLY STORED (NOT IN D OR E)</th>
<th>TOTAL COMPLETED AND STORED TO DATE (D + E + F)</th>
<th>% (G ÷ C)</th>
<th>BALANCE TO FINISH (C - G)</th>
<th>RETAINAGE (IF VARIABLE RATE)</th>
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**GRAND TOTAL**

| $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | 0.00% | $0.00 | $0.00 |

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**User Notes:**
Application and Certificate for Payment

TO OWNER: University of Maine System
by and through
University of Maine at Farmington
224 Main Street
Farmington, ME 04938

FROM
CONTRACTOR: University of Maine at Farmington
224 Main Street
Farmington, ME 04938

VIA
ARCHITECT:

PROJECT:

APPLICATION NO: 1992

PERIOD TO: G102

CONTRACT FOR:

CONTRACT DATE: 0

PROJECT NOS: / / 

Distribution to:
OWNER: 0
ARCHITECT: 0
CONTRACTOR: 0
FIELD: 0
OTHER: 0

CONTRACTOR'S APPLICATION FOR PAYMENT

Application is made for payment, as shown below, in connection with the Contract. AIA Document G703®, Continuation Sheet, is attached.

1. ORIGINAL CONTRACT SUM ............................................................................... .
2. NET CHANGE BY CHANGE ORDERS ............................................................... ..
3. CONTRACT SUM TO DATE (Line 1 ± 2) ........................................................... .
4. TOTAL COMPLETED & STORED TO DATE (Column G on 0703) ................ .
5. RETAINAGE:
   a. _O __ % of Completed Work 
      (Column D + E on G703) 0.00
   b. 0 __ % of Stored Material 
      (Column F on G703) 0.00
   Total Retainage (Lines 5a + 5b or Total in Column I of G703) 0.00
6. TOTAL EARNED LESS RETAINAGE ............................................................... .
   (Line 4 Less Line 5 Total)
7. LESS PREVIOUS CERTIFICATES FOR PAYMENT ......................................... .
   (Line 6 Less from prior Certificate)
8. CURRENT PAYMENT DUE ........................................................................... .
9. BALANCE TO FINISH, INCLUDING RETAINAGE ........................................ .
   (Line 3 Less Line 6) 0.00

CHANGE ORDER SUMMARY

<table>
<thead>
<tr>
<th>CHANGE ORDER SUMMARY</th>
<th>ADDITIONS</th>
<th>DEDUCTIONS</th>
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<td>Total changes approved in previous months by Owner</td>
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<td>Total approved this Month</td>
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<td>TOTALS</td>
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The undersigned Contractor certifies that to the best of the Contractor's knowledge, information and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payment were issued and payments received from the Owner, and that current payment shown herein is now due.

CONTRACTOR:
By: __________________ Date: __________________
State of: __________________
County of: __________________
Subscribed and sworn to before me this day of __________________
Notary Public: __________________
My Commission expires: __________________

ARCHITECT'S CERTIFICATE FOR PAYMENT

In accordance with the Contract Documents, based on on-site observations and the data comprising this application, the Architect certifies to the Owner that to the best of the Architect's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the AMOUNT CERTIFIED.

AMOUNT CERTIFIED ............................................................... .
(Attach explanation if amount certified differs from the amount applied. Initial all figures on this Application and on the Continuation Sheet that are changed to conform with the amount certified.)

ARCHITECT:
By: __________________ Date: __________________

This Certificate is not negotiable. The AMOUNT CERTIFIED is payable only to the Contractor named herein. Issuance, payment and acceptance of payment are without prejudice to any rights of the Owner or Contractor under this Contract.

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User Notes:
SALES TAX FORM

DATE: __________________________

VENDOR: ________________________

Vendor Name

________________________________

Vendor Address

________________________________

Vendor City, State Zip

I hereby certify under penalties of perjury, that:

I am engaged in the performance of a construction contract on a project for the University of Maine System which is a Sales Tax exempt organization under the Maine Sales and Use Tax Law, Section 1760, subsection 2 and 16:

This project is titled: UMF - EARLY CHILDHOOD EDUCATION CENTER
Project Title

The project is located at: UNIVERSITY OF MAINE AT FARMINGTON
Campus Name or Town

This certificate is issued to cover purchases of materials that will be permanently incorporated into the real property belonging to the exempt organization or government agency indicated above.

Signed: ________________________________

Authorized Signature

Name &Title: ________________________________

Firm Name: ________________________________

Firm Address: ________________________________

Firm City, State Zip______________________________

END OF SECTION 00 62 76.13
Consent of Surety to Reduction in or Partial Release of Retainage

PROJECT: (Name and address) Samples

ARCHITECT’S PROJECT NUMBER: 00 62 76.16

TO OWNER: (Name and address) University of Maine System by and through University of Maine at Farmington 222 Main Street Farmington, ME 04938

CONTRACT FOR:

ARCHITECT:

OWNER:

CONTRACT DATED:

SURETY:

OTHER:

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

SURETY,

on bond of
(Insert name and address of Contractor)

CONTRACTOR,

hereby approves the reduction in or partial release of retainage to the Contractor as follows:

The Surety agrees that such reduction in or partial release of retainage to the Contractor shall not relieve the Surety of any of its obligations to
(Insert name and address of Owner)

OWNER,

as set forth in said Surety's bond.

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

(Surety)

(Signature of authorized representative)

Attest: (Seal):

(Printed name and title)
University of Maine System
by and through
University of Maine at Farmington
224 Main Street
Farmington, ME 04938

Project Title: Early Childhood Education Center
Location: University of Maine at Farmington
Contractor: University of Maine at Farmington

Materials and/or equipment (hereinafter “Materials”) that have not yet been incorporated into the work may be
delivered and suitably stored, at the site or some other location agreed upon by the Owner. The Materials listed
below have been estimated at 100% of the cost and will be stored at ________________. The Owner will reimburse the Contractor based upon the prices included on the Schedule of Values Form, 00 62 73(AIA G703), less the cost of installation. The Contractor must complete sufficient copies of this Stored Materials Form, 00 62 79, to accompany the Application for Payment. The Contractor shall secure the signature of its bonding company on all forms and shall also provide a Power of Attorney from the bonding company.

<table>
<thead>
<tr>
<th>Qty</th>
<th>Material/Equipment</th>
<th>Item in AIA G703</th>
<th>Unit Wholesale Price</th>
<th>Extended Wholesale Price</th>
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Surety By: ___________________________ Power of Attorney Must be Attached Attorney-in-Fact

Date: ___________________________

The Contractor, ___________________________, (will store/has stored) certain Materials (at the site
of this project/at an approved warehouse/at bonded warehouse) and will be paid in accordance with the provisions
of the General Conditions of the Contract for Construction. In consideration of the sum of $________ paid to
the contractor by the Owner, and, incompliance with the provisions of the Contract, and, with the intention to be
legally bound, the Contractor does hereby grant, bargain, sell and deliver unto the Owner, it successors and
assigns, all and singular, the Materials described in the schedule above. The Contractor agrees that:

1. Contractor has good title to the Materials, free and clear of all liens and encumbrances, and title is granted
to the Owner;

2. The Materials will be used only in the construction of the above referenced project, under the provisions
of the Contract, and will not be diverted elsewhere without the prior written consent of the Owner;

3. The Materials have been delivered to and are at the places approved for storage, and they are clearly
marked and identified as the property of the Owner and are stored in a safe and secure manner to protect
from damage or loss;
4. The Contractor will pay all expenses in connection with the sale, delivery, storage, protection and insurance of Materials granted to the Owner.

5. The Contractor will remain responsible for the Materials, which will remain under its custody and control for all losses, and will fully indemnify the Owner for the cost of the Materials should the Materials be lost or damaged or stolen, regardless of exclusions in insurance policies required under this document. The contractor has insured the Materials against loss or damage by fire (with extended coverage), theft and burglary, with loss payable to the Owner.

6. The Contractor agrees that the quantities of Materials set forth in the Schedule of Values Form represents the maximum quantities for which it may be entitled to payment under the provisions of the contract;

7. The following information is included with this form:

   (1) An Application for Payment;
   (2) An invoice or copy of an invoice for Materials stored;
   (3) Evidence of payment, or when payment has not been made, a letter on the Contractor’s letterhead authorizing payment to be made jointly to the Contractor and the Supplier;
   (4) Photographs showing the stored Materials and its location;
   (5) a fire and theft insurance policy rider for the stored Materials.
   (6) a warehouseman’s receipt acknowledging that the Materials being stored at the warehouse are being held for the benefit of the Contractor or/University.

Witness:

________________________________________

By: ________________________________________ (SEAL)

Principal/Contractor-Individual

Witness:

________________________________________

Principal/Contractor-Individual

________________________________________

________________________________________

________________________________________

Attest:

________________________________________

Principal/Contractor-Corporation

Secretary

By: ________________________________________

President

END OF SECTION 00 62 79
**Request for Information ("RFI")**

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<th>FROM:</th>
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<td>PROJECT NUMBERS:</td>
<td>REQUESTED REPLY DATE:</td>
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**RFI DESCRIPTION:** (Fully describe the question or type of information requested.)

**REFERENCES/ATTACHMENTS:** (List specific documents researched when seeking the information requested.)

**SPECIFICATIONS:**

**DRAWINGS:**

**OTHER:**

**SENDER'S RECOMMENDATION:** (If RFI concerns a site or construction condition, the sender may provide a recommended solution, including cost and/or schedule considerations.)

**RECEIVER'S REPLY:** (Provide answer to RFI, including cost and/or schedule considerations.)

**BY**

**DATE**

**COPIES TO**

**Note:** This reply is not an authorization to proceed with work involving additional cost, time or both. If any reply requires a change to the Contract Documents, a Change Order, Construction Change Directive or a Minor Change in the work must be executed in accordance with the Contract Documents.
# Architect's Supplemental Instructions

<table>
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<tr>
<th>PROJECT: (name and address)</th>
<th>CONTRACT INFORMATION:</th>
<th>ASI INFORMATION:</th>
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<th>OWNER: (name and address)</th>
<th>ARCHITECT: (name and address)</th>
<th>CONTRACTOR: (name and address)</th>
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<tbody>
<tr>
<td>University of Maine System by and through University of Maine at Farmington 224 Main Street Farmington, ME 04938</td>
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The Contractor shall carry out the Work in accordance with the following supplemental instructions without change in Contract Sum or Contract Time. Proceeding with the Work in accordance with these instructions indicates your acknowledgment that there will be no change in the Contract Sum or Contract Time. *(Insert a detailed description of the Architect’s supplemental instructions and, if applicable, attach or reference specific exhibits.)*

---

**ISSUED BY THE ARCHITECT:**

---

**ARCHITECT** *(Firm name)*

**SIGNATURE**

**PRINTED NAME AND TITLE**

**DATE**
Construction Change Directive

PROJECT: (name and address)
Samples

OWNER: (name and address)
University of Maine System
by and through
University of Maine at Farmington
229 Main Street
Farmington, ME 04938

CONTRACT INFORMATION:
Contract For:
Date:

ARCHITECT: (name and address)

CONTRACTOR: (name and address)

The Contractor is hereby directed to make the following change(s) in this Contract:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits.)

PROPOSED ADJUSTMENTS
1. The proposed basis of adjustment to the Contract Sum or Guaranteed Maximum Price is:
   □ Lump Sum decrease of $0.00
   □ Unit Price of $ per
   □ Cost, as defined below, plus the following fee:
     (Insert a definition of, or method for determining, cost)
     As follows:

2. The Contract Time is proposed to . The proposed adjustment, if any, is .

NOTE: The Owner, Architect and Contractor should execute a Change Order to supersede this Construction Change Directive to the extent they agree upon adjustments to the Contract Sum, Contract Time, or Guaranteed Maximum price for the change(s) described herein.

When signed by the Owner and Architect and received by the Contractor, this document becomes effective IMMEDIATELY as a Construction Change Directive (CCD), and the Contractor shall proceed with the change(s) described above.

ARCHITECT (Firm name)

SIGNATURE

PRINTED NAME AND TITLE

DATE

OWNER (Firm name)

SIGNATURE

PRINTED NAME AND TITLE

DATE

CONTRACTOR (Firm name)

SIGNATURE

PRINTED NAME AND TITLE

DATE
Proposal Request

PROJECT: (name and address)
Samples

OWNER: (name and address)
University of Maine System
by and through
University of Maine at Farmington
224 Main Street
Farmington, ME 04938

CONTRACT INFORMATION:
Contract For:
Date:

ARCHITECT: (name and address)

CONTRACTOR: (name and address)

The Owner requests an itemized proposal for changes to the Contract Sum and Contract Time for proposed modifications to the Contract Documents described herein. The Contractor shall submit this proposal within Zero (0) days or notify the Architect in writing of the anticipated date of submission.

(Insert a detailed description of the proposed modifications to the Contract Documents and, if applicable, attach or reference specific exhibits.)

THIS IS NOT A CHANGE ORDER, A CONSTRUCTION CHANGE DIRECTIVE, OR A DIRECTION TO PROCEED WITH THE WORK DESCRIBED IN THE PROPOSED MODIFICATIONS.

REQUESTED BY THE ARCHITECT:

PRINTED NAME AND TITLE
Change Order

PROJECT: (Name and address)
Samples

OWNER: (Name and address)
University of Maine System
by and through
University of Maine at Farmington
224 Main Street
Farmington, ME 04938

ARCHITECT: (Name and address)

CONTRACTOR: (Name and address)

THE CONTRACT IS CHANGED AS FOLLOWS:
(Insert a detailed description of the change and, if applicable, attach or reference specific exhibits. Also include agreed upon adjustments attributable to executed Construction Change Directives.)

The original Contract Sum was
The net change by previously authorized Change Orders
The Contract Sum prior to this Change Order was
The Contract Sum will be increased by this Change Order in the amount of
The new Contract Sum including this Change Order will be
The Contract Time will be increased by Zero (0) days.
The new date of Substantial Completion will be

NOTE: This Change Order does not include adjustments to the Contract Sum or Guaranteed Maximum Price, or the Contract Time, that have been authorized by Construction Change Directive until the cost and time have been agreed upon by both the Owner and Contractor, in which case a Change Order is executed to supersede the Construction Change Directive.

NOT VALID UNTIL SIGNED BY THE ARCHITECT, CONTRACTOR AND OWNER.

ARCHITECT (Firm name)

SIGNATURE

PRINTED NAME AND TITLE

DATE

CONTRACTOR (Firm name)

SIGNATURE

PRINTED NAME AND TITLE

DATE

OWNER (Firm name)

SIGNATURE

PRINTED NAME AND TITLE

DATE
Certificate of Substantial Completion

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<th>CERTIFICATE INFORMATION:</th>
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<table>
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<tr>
<th>OWNER: (name and address)</th>
<th>ARCHITECT: (name and address)</th>
<th>CONTRACTOR: (name and address)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Maine System</td>
<td></td>
<td></td>
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<tr>
<td>by and through</td>
<td></td>
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<tr>
<td>University of Maine at Farmington</td>
<td></td>
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<tr>
<td>224 Main Street</td>
<td></td>
<td></td>
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<tr>
<td>Farmington, ME 04938</td>
<td></td>
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</tr>
</tbody>
</table>

The Work identified below has been reviewed and found, to the Architect’s best knowledge, information, and belief, to be substantially complete. Substantial Completion is the stage in the progress of the Work when the Work or designated portion is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of the Project or portion designated below is the date established by this Certificate.

(Identify the Work, or portion thereof, that is substantially complete.)

<table>
<thead>
<tr>
<th>ARCHITECT (Firm Name)</th>
<th>SIGNATURE</th>
<th>PRINTED NAME AND TITLE</th>
<th>DATE OF SUBSTANTIAL COMPLETION</th>
</tr>
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</table>

WARRANTIES
The date of Substantial Completion of the Project or portion designated above is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

(Identify warranties that do not commence on the date of Substantial Completion, if any, and indicate their date of commencement.)

WORK TO BE COMPLETED OR CORRECTED
A list of items to be completed or corrected is attached hereto, or transmitted as agreed upon by the parties, and identified as follows:

(Identify the list of Work to be completed or corrected.)

The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Unless otherwise agreed to in writing, the date of commencement of warranties for items on the attached list will be the date of issuance of the final Certificate of Payment or the date of final payment, whichever occurs first. The Contractor will complete or correct the Work on the list of items attached hereto within ( ) days from the above date of Substantial Completion.

Cost estimate of Work to be completed or corrected: $

The responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work, insurance, and other items identified below shall be as follows:

(Note: Owner’s and Contractor’s legal and insurance counsel should review insurance requirements and coverage.)

The Owner and Contractor hereby accept the responsibilities assigned to them in this Certificate of Substantial Completion:

<table>
<thead>
<tr>
<th>CONTRACTOR (Firm Name)</th>
<th>SIGNATURE</th>
<th>PRINTED NAME AND TITLE</th>
<th>DATE</th>
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</table>

<table>
<thead>
<tr>
<th>OWNER (Firm Name)</th>
<th>SIGNATURE</th>
<th>PRINTED NAME AND TITLE</th>
<th>DATE</th>
</tr>
</thead>
</table>
SECTION 00 65 19
CERTIFICATE OF COMPLETION FORM
(Final)

DATE: ________________________________

PROJECT NAME: UMF - EARLY CHILDHOOD EDUCATION CENTER
SUBSTANTIAL COMPLETION DATE: ________________________________

FINAL COMPLETION is defined as the date certified by the Architect when all the Work of the Project is fully complete, the Close-Out requirements have been completed, including the Close-Out Meeting and approval of Close-Out by the Owner, and the Contract fully performed in accordance with the Contract Documents, and the Contractor entitled to final payment.

The CONTRACTOR certifies that the Work is fully completed and was completed on or before ____________, 20____, and submits herewith:

Application for Final Payment (release of retainage)
Waiver of Lien

CONTRACTOR: ________________________________________________

By: __________________________________________________________ Date: ________________________________

Name: ________________________________________________________

The ARCHITECT has inspected the Work and has determined that the Date of Final Completion was ________________ , 20____.

ARCHITECT: ________________________________________________

By: __________________________________________________________ Date: ________________________________

Name: ________________________________________________________

The OWNER hereby accepts the Work as fully complete and will make final payment.

OWNER: ________________________________________________

By: __________________________________________________________ Date: ________________________________

Name: ________________________________________________________

END OF SECTION 00 65 19
AIA Document G706™ – 1994

Contractor's Affidavit of Payment of Debts and Claims

PROJECT: (Name and address) Samples

ARCHITECT'S PROJECT NUMBER: Owner:

TO OWNER: (Name and address) University of Maine System by and through University of Maine at Farmington 224 Main Street Farmington, ME 04938

CONTRACT FOR: Contract Date:

SURETY: Other:

STATE OF:
COUNTY OF:

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

EXCEPTIONS:

SUPPORTING DOCUMENTS ATTACHED HERETO: CONTRACTOR: (Name and address)

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. AIA Document G707, Consent of Surety, may be used for this purpose

Indicate Attachment: ☐ Yes ☐ No

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

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.

2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.


BY:

(Signature of authorized representative)

(Printed name and title)

Subscribed and sworn to before me on this date:

Notary Public:

My Commission Expires:
# Contractor's Affidavit of Release of Liens

**PROJECT:** (Name and address)  
Samples  
**TO OWNER:** (Name and address)  
University of Maine System  
by and through  
University of Maine at Farmington  
224 Main Street  
Farmington, ME 04938  

**ARCHITECT’S PROJECT NUMBER:**  
**OWNER:** ☐  
**ARCHITECT:** ☐  
**CONTRACTOR:** ☐  
**SURETY:** ☐  
**OTHER:** ☐  

**STATE OF:**  
**COUNTY OF:**  

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

**EXCEPTIONS:**

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

**CONTRACTOR:** (Name and address)  
**BY:**  
(Signature of authorized representative)  
(Printed name and title)  

Subscribed and sworn to before me on this date:  

Notary Public:  
My Commission Expires:

---

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User Notes:  

UMF - ECEC  
00 65 19.16 - 1  
G706A - Contractor's Affidavit of Release of Liens
DATE: ________________________________

State of Maine
County of ________________________________

TO: University of Maine System
by and through
University of Maine at Farmington
246 Main Street
Farmington, ME 04938

SUBJECT:

Project Name: EARLY CHILDHOOD EDUCATION CENTER
Project Location: UNIVERSITY OF MAINE AT FARMINGTON

Upon receipt of the sum of ________________________________ (being the balance due us under the existing contract or subcontract agreement for work on the Subject Project) the undersigned agrees that it will waive and release the University of Maine System from any and all lien or claim or right to lien on the Subject Project under the Statutes of the state of Maine relating to liens for labor, materials and/or subcontracts furnished for the Subject Project on premises belonging to the University of Maine System.

Signed: ___________________________________________

Title: _____________________________________________

Firm Name: ________________________________________

NOTARY

Subscribed and sworn to before me this _________ day of ________________, 20______.

_______________________________________________
Signature Notary Public

END OF SECTION 00 65 19.17
DATE: __________________________

State of Maine
County of __________________________

SUBJECT:

Project Name: EARLY CHILDHOOD EDUCATION CENTER
Project Location: UNIVERSITY OF MAINE AT FARMINGTON

_______________________________(hereinafter called the Subcontractor) in consideration of the sum of $________________________ to be paid to Subcontractor by __________________________ upon receipt of said payment does hereby release and forever discharge __________________________ and the University of Maine System from any and all workman’s, materialman’s, mechanic’s, building or other liens, claims, causes of action, liabilities and other obligations with respect to the value of any and all work, services and materials furnished, performed, or supplied by the subcontractor to or in connection with the construction project known as the Insert Project Name Here located in Insert Location Here (hereinafter called the “Premises”) through the date of __________________________. Subcontractor shall take all reasonable action to discharge any lien currently filed or pending against __________________________ and the University of Maine System, including without limitation the recording of instruments discharging said lien with the appropriate Registry of Deeds.

Subcontractor acknowledges that its receipt of said payment will constitute full and final payment for all work performed by Subcontractor through the date set forth above except for retainage if applicable, in the amount of ($)________________________.

Subcontractor further covenants and represents that all of the subcontract suppliers, mechanics, materialmen, and laborers listed below engaged by Subcontractor have been paid in full (less proper retainage if any) or shall be immediately paid in full from the proceeds of this current payment for all work done and or materials furnished to the Premises through the date set forth in the first paragraph above. The Subcontractor hereby agrees to indemnify, defend, and hold __________________________ and The University of Maine System harmless from any and all claims, including but not limited to attorney fees, claims for payment, and liens of any kind or nature filed or made by any person or entity based upon work done or materials furnished in connection with the Premises by the Subcontractor or any sub-subcontractor, suppliers, mechanics, materialmen, and laborers employed by Subcontractor through the date set forth in the first paragraph above. Subcontractor shall request any sub-subcontractor, suppliers, mechanics, materialmen, and laborers employed by Subcontractor through the date set forth in the first paragraph above to, and shall itself, take all reasonable action to discharge any lien in connection with payments owed by Subcontractor currently filed or pending against __________________________ and the University of Maine System, including without limitation the recording of instruments discharging said lien with the appropriate Registry of Deeds.

Major sub-subcontractors and suppliers whose contract or purchase order meets or exceeds $5,000 working for said Subcontractor for the period stated above:
SECTION 00 65 19.18

The undersigned represents that he is authorized by all corporate or other action necessary to execute and deliver this release.

Signed: ____________________________________________

Title: ________________________________________________

Firm Name: ____________________________________________

NOTARY

Subscribed and sworn to before me this ________ day of ________________, 20______.

__________________________________________
Signature Notary Public

END OF SECTION 00 65 19.17
Consent Of Surety to Final Payment

PROJECT: (Name and address)
Samples

ARCHITECT'S PROJECT NUMBER: 

OWNER: ☐

ARCHITECT: ☐

CONTRACT FOR: 

CONTRACTOR: ☐

SURETY: ☐

OTHER: ☐

TO OWNER: (Name and address)
University of Maine System
by and through
University of Maine at Farmington
224 Main Street
Farmington, ME 04938

CONTRACT DATED: 

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

, SURETY,

on bond of
(Insert name and address of Contractor)

, CONTRACTOR,

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

, OWNER,

as set forth in said Surety's bond.

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

(Surety)

(Signature of authorized representative)

(Printed name and title)

Attest:
(Seal):
AIA® Document A201® – 2017

General Conditions of the Contract for Construction

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

THE OWNER:
(Name, legal status and address)
University of Maine System
by and through
University of Maine at Farmington
224 Main Street
Farmington, ME 04938

THE ARCHITECT:
(Name, legal status and address)

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

User Notes:
(1298805103)
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ARTICLE 1   GENERAL PROVISIONS
§ 1.1 Basic Definitions
§ 1.1.1 The Contract Documents
The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor’s bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract
The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect’s consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect’s consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under theContract intended to facilitate performance of the Architect’s duties.

§ 1.1.3 The Work
The term “Work” means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor’s obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project
The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

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

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

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

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

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

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

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Where the Procurement Requirements include provisions that portions of the Work be File Bid in accordance with the requirements of the Maine Bid Depository System, the subcontracts for these portions of the work will cover the same scope of work as defined by the Procurement Requirements and the File Bid and shall have the same contract amount as listed in the successful bid.

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

§ 1.3 Capitalization
Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation
In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service
§ 1.5.1 The Architect and the Architect’s consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect’s or Architect’s consultants’ reserved rights. The provisions of this section shall not be deemed to modify the contract between the University of Maine System (the Owner) and the Architect under B102-2017 and B201-2017.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect’s consultants. The provisions of this section shall not be deemed to modify the contract between the University of Maine System (the Owner) and the Architect under B102-2017 and B201-2017.

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

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.
§ 1.7 Digital Data Use and Transmission
The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document G201-2013 Project Digital Data Protocol Form and E203™-2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance
Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™-2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™-2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party’s sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER
§ 2.1 General
§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner’s approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner’s authorized representative.

.1 For the purpose of this Contract, the Owner is defined as: University of Maine System, acting through its duly authorized agent.

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

§ 2.2 Evidence of the Owner’s Financial Arrangements
§ 2.2.1 Prior to Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor’s request, the Contractor may immediately stop the Work and, in that event, notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor’s reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor’s request, the Contractor may immediately stop the Work and, in that event, notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor’s reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.
After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor. Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days’ notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

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

§ 2.3 Information and Services Required of the Owner

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

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. Architect is a person or entity lawfully licensed to practice in the State of Maine. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number. Whenever the prime professional designer for the Work is an Engineer, the term Architect, wherever used in these documents shall have the term Engineer substituted for the term Architect. The Engineer shall be lawfully licensed to practice engineering in the State of Maine or an entity lawfully practicing engineering identified as such in the Agreement.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work at all times conduct safe performance of the Work, including but not limited to appropriate precautions.

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

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

§ 2.4 Owner’s Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner
to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

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

ARTICLE 3 CONTRACTOR
§ 3.1 General
§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor’s authorized representative.

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

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

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor’s review is made in the Contractor’s capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor’s notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors,
inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures
§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor’s best industry standard or better skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor’s proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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

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

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

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

§ 3.4.2.1 After the Contract has been executed, the Owner and Architect may consider a formal request for substitution of products in place of those specified. The Owner shall deduct from the next payment made from the Contract Sum amounts paid to the Architect to evaluate the Contractor’s proposed substitutions and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner’s acceptance of the substitutions. By making requests for substitutions, the Contractor

1. Represents that the Contractor has personally investigated the proposed substitute product and determined it is equal or superior in all respects to that specified;
2. Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;
3. Certifies that the cost data presented is complete and includes all related costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and,
4. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be completed in all respects.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor’s employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.4.4 If a wage scale prepared by the State of Maine Department of Labor, Bureau of Labor Standards, is included in the Contract Documents, such wage scale represents the minimum wages that must be paid in each category of labor employed on the project.
The provisions of Title 26 MRSA Chapter 15 Preference to Maine Workers and Contractors, apply to this project, including but not limited to:

§ 1310. Wage and benefits rates to be kept posted
A clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed by them and all independent contractors working under contract with them in connection with the construction on the project, including but not limited to:

§ 1311. Wage and benefit record of contractor
The contractor and each subcontractor in charge of the construction of a public work shall keep an accurate record showing the names and occupation of all laborers, workers and mechanics employed by them and all independent contractors working under contract with them in connection with the construction on the public works. The record must also show for all laborers, workers, mechanics and independent contractors the hours worked, the title of the job, the hourly rate or other method of remuneration and the actual wages or other compensation paid to each of the laborers, workers, mechanics and independent contractors. A copy of such a record must be kept at the job site and must be open at all reasonable hours to the inspection of the Bureau of Labor Standards and the public authority that let the contract and its officers and agents. It is not necessary to preserve those records for a period longer than 3 years after the termination of the contract. A copy of each such record must also be filed monthly with the public authority that let the contract. The filed record is a public record pursuant to Title 1, chapter 13, except that the public authority letting a contract shall adopt rules to protect the privacy of personal information contained in the records filed with the public authority under this section, such as Social Security numbers and taxpayer identification numbers. The rules may not prevent the disclosure of information regarding the classification of workers or independent contractors and the remuneration they receive. Such rules are routine technical rules as defined by Title 5, chapter 375, subchapter 2-A.

§ 3.4.5 If a wage scale prepared by the U.S. Department of Labor pursuant to the provision of the Davis-Bacon Act is included in the Contract Documents, such wage scale represents the minimum wages that must be paid in each category of labor on the project. The requirements and responsibilities within the Davis-Bacon Act apply to this project if a Davis-Bacon wage scale is included.

§ 3.4.6 EQUAL EMPLOYMENT OPPORTUNITY
During the performance of this contract, the contractor agrees as follows:

.1 The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, including transgender status or gender expression, national origin or citizenship status, ancestry, age, disability, genetic information, or veterans status. Such action shall include, but not be limited to, the following: employment, upgrading, demotions, transfers, recruitment or recruitment advertising; layoffs or terminations; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

.2 The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, including transgender status or gender expression, national origin or citizenship status, ancestry, age, disability, genetic information, or veterans status.

.3 The contractor will send to each labor union or representative of the workers with which there is a collective or bargaining agreement in place, or other contract or understanding, whereby labor is being furnished for the performances of his contract, a notice, as set forth by the Maine Human Rights Commission, found on their website (https://www1.maine.gov/mhrc/guidance/mhra_guarantees.htm), to be provided by the contracting department or agency, advising the said labor union or workers’ representative of the contractor’s commitment under the provisions of the contract, and shall post copies of the notice in conspicuous places available to employees and to applicants for employment.

.4 The contractor will cause the foregoing provisions to be inserted in all contracts for any work covered by this agreement so that such provisions will be binding upon each subcontractor.

.5 Contractors and subcontractors with contracts in excess of $50,000 will also pursue in good faith affirmative action programs.
§ 3.5 Warranty
§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor’s warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

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

§ 3.6.1 The University of Maine System is exempt from payment of taxes under the Maine Sales and Use Tax Law Title 36 Section 1760 for taxes on materials that are permanently incorporated into the real property belonging to the University of Maine System. The University of Maine System is also exempt from the payment of Federal Excise Taxes on articles not for resale and from the Federal Transportation Tax on all shipments; exemption certificates for these taxes will be furnished when required. All quotations shall be less these taxes. The contractor shall pay all other taxes that have been or are legally enacted.

§ 3.7 Permits, Fees, Notices and Compliance with Laws
§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

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

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

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

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

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,
.1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
.2 Contractor’s costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
.3 whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor’s costs under Section 3.8.2.2.

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

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

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

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

§ 3.10 Contractor’s Construction and Submittal Schedules
§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner’s and Architect’s information a Contractor’s construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

.1 The Contractor shall provide an updated Construction Schedule with each Application for Payment reflecting actual construction progress and activities.

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

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

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

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

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

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

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

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

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

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

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect’s approval of a resubmission shall not apply to such revisions.

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

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

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

§ 3.12.11 The Architect’s review of the Contractor’s submittals will be limited to examination of an initial submission and two (2) resubmittals. The Architect’s review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall deduct from the next payment made from the Contract Sum amounts paid to the Architect for evaluation of such additional submittals.

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

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

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

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

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.15.3 Waste Management. The University is committed to a resource management strategy which reduces to a minimum the production of waste material while reusing, recycling or composting as much as possible of the remaining materials. Contractor will submit a construction waste management plan for the project that identifies opportunities to reduce, reuse, or recycle waste from renovations or new construction.
§ 3.16 Access to Work
The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

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

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

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

ARTICLE 4   ARCHITECT
§ 4.1 General
§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract
§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner’s representative during construction until the date the final payment is due, and from time to time during the period for correction of Work described in § 12.2, and until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, endeavor to guard the Owner against defects and deficiencies in the Work, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor’s rights and responsibilities under the Contract Documents.
The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect as determined solely by the Owner, or request of the Contractor. The reimbursement shall be deducted from the next payment made from the Contract Sum following the Owner’s payment to the Architect.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor’s failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications
The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect’s services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect’s consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect’s evaluations of the Contractor’s Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor’s submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect’s action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect’s professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect’s review of the Contractor’s submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect’s review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect’s approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner’s review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect’s responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.
§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect’s response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

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

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect’s response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS
§ 5.1 Definitions
§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term “Subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term “Subcontractor” does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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

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

1 The Contractor shall provide Owner a list of all subcontractors and independent contractors on the job site and a record of the entity to whom that subcontractor or independent contractor is directly contracted and by whom that subcontractor or independent contractor is insured for workers’ compensation purposes. The list shall be presented at the preconstruction meeting and, when changes occur, at each requisition meeting as necessary.

2 Where the use of the Maine Bid Depository is required by the Procurement Requirements, Subcontractors included in the Contractor’s Proposal shall be the Subcontractors for the defined Work unless a change has been approved by the Owner.

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

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor’s Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.
§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

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

§ 5.4 Contingent Assignment of Subcontracts
§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
§ 6.1 Owner’s Right to Perform Construction and to Award Separate Contracts
§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner’s own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner’s own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.
§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner’s own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility
§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor’s construction and operations with theirs as required by the Contract Documents.

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

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

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

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

§ 6.3 Owner’s Right to Clean Up
If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

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

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

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

§ 7.1.4 The combined overhead and profit included in the total cost to the Owner of a Change in the Work shall be based on a previously agreed upon unit pricing or on the following schedule allowing for appropriate allowances for contract duration:

.1 For the Contractor, for Work performed by the Contractor’s own forces, 20% of the cost.
.2 For the Contractor, for Work performed by the Contractor’s Subcontractors, 10% of the amount due the Subcontractors.
.3 For each Subcontractor involved, for Work performed by the Subcontractor’s own forces, 20% of the cost.

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For each Subcontractor involved, for Work performed by the Subcontractor’s Sub-subcontractors, 10% of the amount due the Sub-subcontractor.

Costs to which overhead and profit is to be applied shall be limited to the following:

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

2. Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

3. Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others; and,

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

§ 7.1.5 When there is only an extension of Contract Time, any Claim for delay made pursuant to Article 15 is limited to additional costs related to supervision and field office personnel, which may be included in the overhead and profit calculation.

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

§ 7.2 Change Orders

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

1. The change in the Work;

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

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

§ 7.3 Construction Change Directives

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

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

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

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

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

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

4. As provided in Section 7.3.4.

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

1. Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers’ compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

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

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

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

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

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect’s professional judgment, to be reasonably justified. The Architect’s interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

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

ARTICLE 8 TIME
§ 8.1 Definitions
§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

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

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

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.
§ 8.2 Progress and Completion
§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

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

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

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

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

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

ARTICLE 9 PAYMENTS AND COMPLETION
§ 9.1 Contract Sum
§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

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

§ 9.2 Schedule of Values
Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor’s Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor’s subsequent Applications for Payment.

§ 9.3 Applications for Payment
§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor’s right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.
§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 The provisions of Title 5 M.R.S.A § 1746, as amended, pertain to this project. The Owner shall retain five percent (5%) of each payment due the Contractor as part of the security for the fulfillment of the Contract Agreement by the Contractor; the Contractor shall not withhold a greater percentage from subcontractors. The Owner may, if deemed expedient by the Owner, cause the Contractor to be paid temporarily or permanently from time to time during the progress of the work, such portion of the amount retained as the Owner deems prudent or desirable.

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

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

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

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect’s evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect’s knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor’s right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used labor, materials, and equipment relating to the Work.

§ 9.5 Decisions to Withhold Certification
§ 9.5.1 The Architect may shall withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect’s opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may shall also withhold a Certificate for Payment or, because of subsequently discovered evidence, may shall nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect’s opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of
.1 defective Work, i.e. Work that does not conform to the requirements of the Contract, shall include, but not be limited to, non-conforming Work, disputed Work, incomplete Work, and unacceptable Work, which is not remedied;

.1 The Architect shall deduct and withhold from any certification for payment an amount equal to one hundred and fifty percent (150%) the value of any defective Work.

.2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

.3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a Separate Contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

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

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

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

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

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

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

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary
liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

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

§ 9.6.9 All Progress Payments and Final Payment are subject to the requirements of the "Maine Prompt Pay Act" Title 10 M.R.S.A. ch. 201-A, as amended. Payments shall be made on a timely basis in accord with the requirements of this Statute; however, the Contractor waives interest on any late payment.

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

§ 9.8 Substantial Completion
§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

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

§ 9.8.3 Upon receipt of the Contractor’s list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect’s inspection discloses any item, whether or not included on the Contractor’s list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

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

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

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

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

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

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor’s notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect’s knowledge, information and belief, and on the basis of the Architect’s on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect’s final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor’s being entitled to final payment have been fulfilled.

.1 Except with the consent of the Owner, the Architect will perform no more than three (3) site reviews to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for any additional site reviews.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner’s property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers’ warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys’ fees.

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

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
failure of the Work to comply with the requirements of the Contract Documents;
.3 terms of special warranties required by the Contract Documents; or
.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

§ 9.11 The Contractor and the Contractor’s Surety, if any, shall be liable for and shall pay the Owner the sums stipulated as liquidated damages in the Contract Documents for each calendar day of delay after the date established for Substantial Completion in the Contract Documents until the Work is substantially complete.

ARTICLE 10   PROTECTION OF PERSONS AND PROPERTY
§ 10.1 Safety Precautions and Programs
The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property
§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to
.1 employees on the Work and other persons who may be affected thereby;
.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
.4 If this Contract involves renovation, repair, or preparation of surfaces for painting in pre-1978 apartments, houses, or spaces used by child care facilities, Contractor shall use certified workers who follow the lead-safe work practices as required by the US Environmental Protection Agency’s Renovation, Repair and Remodeling rule described in 40 CFR § 745.85. Notification of the tenants or users under this rule will be the responsibility of the Owner.

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

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

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

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor’s obligations under Section 3.18.
§ 10.2.6 The Contractor shall designate a responsible member of the Contractor’s organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor’s superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

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

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

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

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

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect’s consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to exclusive of attorneys’ fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity. This indemnification obligation shall not apply to any claim for which Owner would not be liable under the Maine Tort Claims Act (14 M.R.S.A. ’8101, et seq.) if such claim were made directly against Owner and Owner shall continue to enjoy all rights, claims, immunities and defenses available to it under law.

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

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner’s fault or negligence.
§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all costs and expense thereby incurred, exclusive of attorneys’ fees.

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

ARTICLE 11 INSURANCE AND BONDS

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

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

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

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

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

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

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

§ 11.3 Waivers of Subrogation
§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors,
sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect’s consultants; and (3)
Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages
caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the
Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such
insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals
and entities identified above from the Architect, Architect’s consultants, Separate Contractors, subcontractors, and
sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive
claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be
effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification,
contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly,
or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent
to the site by property insurance under policies separate from those insuring the Project, or if after final payment
property insurance is to be provided on the completed Project through a policy or policies other than those insuring the
Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in
accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate
property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance
The Owner, at the Owner’s option, may purchase and maintain insurance that will protect the Owner against loss of
use of the Owner’s property, or the inability to conduct normal operations, due to fire or other causes of loss. The
Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner’s property, due to
fire or other hazards however caused, with the exception of intentional acts or grossly negligent consultants,
contractors or sub-contractors.

§ 11.5 Adjustment and Settlement of Insured Loss
§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as
fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to
requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and
Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect
and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed
settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 44-30 days from
receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object,
the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the
Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter,
if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor
shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that
purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the
proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising
out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any
dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed
Work.
ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect’s request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect’s examination and be replaced at the Contractor’s expense without change in the Contract Time.

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

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

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

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

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

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor’s correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor’s liability with respect to the Contractor’s obligations other than specifically to correct the Work.
§ 12.3 Acceptance of Nonconforming Work
If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS
§ 13.1 Governing Law
The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction’s choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

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

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

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

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

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

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

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

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.
§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

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

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT
§ 14.1 Termination by the Contractor
§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:
   .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
   .2 An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
   .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
   .4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

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

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

§ 14.2 Termination by the Owner for Cause
§ 14.2.1 The Owner may terminate the Contract if the Contractor
   .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
   .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
   .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
   .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor’s surety, if any, seven days’ notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:
   .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

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

§ 14.4.3 In case of such termination for the Owner’s convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement; but not including overhead and profit on Work not executed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

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

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

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker’s decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

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

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party’s termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

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

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

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

§ 15.4 Arbitration

§ 15.4.1 If the The parties have selected arbitration as the method for binding dispute resolution in the Agreement, any
Claim in this Agreement, any claim, dispute or other matter in question arising out of or related to this Agreement subject
to, but not resolved by, mediation shall be subject to arbitration which, arbitration, which unless the parties mutually
agree otherwise, shall be administered by the American Arbitration Association conducted in the place where the
Project is located, unless another place is mutually agreed upon, and in accordance with its Construction Industry
Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the
Project is located, unless another location is mutually agreed upon, this Agreement, except that the parties shall select
only one Arbitrator, and there shall be no discovery. A demand for arbitration shall be made in writing, delivered to
the other party to the Contract, this Agreement, and filed with the person or entity administering the arbitration. The
party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which
arbitration is permitted to be demanded-defended.

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

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

§ 15.4.4 Consolidation or Joinder

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

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

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this
Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner
and Contractor under this Agreement.
Liquidated damages (a fixed amount set forth in the Contract) agreed to by the Owner and the Contractor are intended to compensate the Owner for unexcused delay in the performance of the Contract. The parties agree that the purpose of the liquidated damages schedule below is to establish, in advance, a reasonable estimate of the damages that would be incurred by the Owner if there is an unexcused delay, or a breach of Contract, which causes the work to be extended beyond the contractual substantial completion date. This agreement of liquidated damages by the parties is made to establish the reasonableness of them to the actual damages an Owner may have incurred due to unexcused delays by the Contractor, even though the actual damages may be an uncertain amount and unprovable.

The specific per diem rates of Liquidated Damages are [enter amount if can reasonably determine—provide method of determination; otherwise set forth below]. By executing the Contract, the Contractor acknowledges that such an amount is not a penalty and that the daily amount set forth in the Contract is a reasonable per diem forecast of damages incurred by the Owner due to the Contractor’s failure to complete the Work within the Contract Time.

<table>
<thead>
<tr>
<th>Original Contract Amount</th>
<th>Per Diem Amount of Liquidated Damages</th>
</tr>
</thead>
<tbody>
<tr>
<td>From More Than 0 and Including 100,000</td>
<td>$500</td>
</tr>
<tr>
<td>$100,000 to $300,000</td>
<td>$675</td>
</tr>
<tr>
<td>$300,000 to $500,000</td>
<td>$750</td>
</tr>
<tr>
<td>$500,000 to $1,000,000</td>
<td>$825</td>
</tr>
<tr>
<td>$1,000,000 to $2,000,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>$2,000,000 to $4,000,000</td>
<td>$1,250</td>
</tr>
<tr>
<td>$4,000,000 and more</td>
<td>$1,500</td>
</tr>
</tbody>
</table>

END OF SECTION 00 73 00.11
Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the N/A day of ___ in the year Sample
(In words, indicate day, month and year.)

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

THE OWNER:
(Name, legal status and address)
University of Maine System
by and through
University of Maine at Farmington
224 Main Street
Farmington, ME 04938

THE CONTRACTOR:
(Name, legal status and address)

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

This document is intended to be used in conjunction with AIA Document A201®–2017, General Conditions of the Contract for Construction. Article 11 of A201®–2017 contains additional insurance provisions.

TABLE OF ARTICLES

A.1 GENERAL
A.2 OWNER'S INSURANCE
A.3 CONTRACTOR'S INSURANCE AND BONDS
A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL
The Owner and Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this Exhibit. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE
§ A.2.1 General
Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor’s request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.
§ A.2.2 Liability Insurance
The Owner shall be responsible for purchasing and maintaining the Owner’s usual general liability insurance.

§ A.2.3 Required Property Insurance
§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.2.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder’s risk “all risks” completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner’s property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, or windstorm. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:

(Indicate below the cause of loss and any applicable sub-limit.)

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect’s and Contractor’s services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:

(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

<table>
<thead>
<tr>
<th>Causes of Loss</th>
<th>Sub-Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.</td>
<td></td>
</tr>
</tbody>
</table>

| § A.2.3.1.4 Deductibles and Self-Insured Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions. |

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The Owner’s occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuation of
coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below. (Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[ ] § A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance, to reimburse the Owner for loss of use of the Owner’s property, or the inability to conduct normal operations due to a covered cause of loss.

[ ] § A.2.4.2 Ordinance or Law Insurance, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

[ ] § A.2.4.3 Expediting Cost Insurance, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

[ ] § A.2.4.4 Extra Expense Insurance, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

[ ] § A.2.4.5 Civil Authority Insurance, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

[ ] § A.2.4.6 Ingress/Egress Insurance, for loss due to the necessary interruption of the insured’s business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

[ ] § A.2.4.7 Soft Costs Insurance, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects,
§ A.2.5 Other Optional Insurance.
The Owner shall purchase and maintain the insurance selected below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[ ] § A.2.5.1 Cyber Security Insurance for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. (Indicate applicable limits of coverage or other conditions in the fill point below.)

[ ] § A.2.5.2 Other Insurance
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Limits</th>
</tr>
</thead>
</table>

ARTICLE A.3 CONTRACTOR’S INSURANCE AND BONDS
§ A.3.1 General
§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner’s written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor’s Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.1.1 Certificates of Insurance filed with the University of Maine System shall indicate the Certificate Holder as:

University of Maine System
Office of Risk Management
Robinson Hall
46 University Drive
Augusta, ME 04330

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect’s consultants as additional insureds for claims caused in whole or in part by the Contractor’s negligent acts or omissions during the Contractor’s operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor’s negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner’s general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect’s consultants, CG 20 32 07 04. All required insurance shall be provided by companies that have a current A.M. Best insurance rating of A- or better and that are licensed or approved to do business in the State of Maine.
§ A.3.2 Contractor’s Required Insurance Coverage
§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

§ A.3.2.2 Commercial General Liability
§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than two million dollars ($2,000,000) each occurrence, two million dollars ($2,000,000) general aggregate, and two million dollars ($2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including
.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
.2 personal injury and advertising injury;
.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;
.4 bodily injury or property damage arising out of completed operations; and
.5 the Contractor’s indemnity obligations under Section 3.18 of the General Conditions.
§ A.3.2.2.2 The Contractor’s Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:
.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.
.2 Claims for property damage to the Contractor’s Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.
.3 Claims for bodily injury other than to employees of the insured.
.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.
.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.
.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.
.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.
.8 Claims related to roofing, if the Work involves roofing.
.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.
.10 Claims related to earth subsidence or movement, where the Work involves such hazards.
.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than one million dollars ($1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.
§ A.3.2.5 Workers’ Compensation at statutory limits.

§ A.3.2.6 Employers’ Liability with policy limits not less than five hundred thousand dollars ($500,000) each accident, five hundred thousand dollars ($500,000) each employee, and five hundred thousand dollars ($500,000) policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers’ Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks. Policy limits for such coverage shall not be less than five hundred thousand dollars ($500,000) each accident, five hundred thousand dollars ($500,000) each employee, and five hundred thousand dollars ($500,000) policy limit. Contractor is required to provide proof of such coverage, if applicable to the Work, by submitting a copy of the endorsement or by submitting the USLH form WC 00 01 06 A (current edition).

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than one million dollars ($1,000,000) per claim and one million dollars ($1,000,000) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than one million dollars ($1,000,000) per claim and two million dollars ($2,000,000) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than one million dollars ($1,000,000) per claim and two million dollars ($2,000,000) in the aggregate.

§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than two million dollars ($2,000,000) per claim and two million dollars ($2,000,000) in the aggregate. Authorization from Administration of the University of Maine System must be obtained thirty (30) days prior to the utilization of the equipment.

§ A.3.3 Contractor’s Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

N/A

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[ ] § A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3-insurance. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any
deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:

(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

§ A.3.3.2.2 Railroad Protective Liability Insurance, with policy limits of not less than ($ ) per claim and ($ ) in the aggregate, for Work within fifty (50) feet of railroad property.

§ A.3.3.2.3 Asbestos Abatement Liability Insurance, with policy limits of not less than one million dollars ($1,000,000) per claim and two million dollars ($2,000,000) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

§ A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

§ A.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

§ A.3.3.2.6 Other Insurance

(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

<table>
<thead>
<tr>
<th>Coverage</th>
<th>Limits</th>
</tr>
</thead>
</table>

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located, as follows, and the Contractor shall furnish a Performance Bond and a Payment Bond covering the faithful performance of the Contract and payment of obligations arising thereof. Bonds may be obtained through the Contractor’s usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100% of the Contract Sum. Should the Contract Sum change during the contract and warranty periods, the amount of the Bonds will be changed to reflect the Contract Sum.

1. The Contractor shall deliver the required bonds to the Owner at the same time as the signed Contract Agreement is delivered to the Owner. Prior to the commencement of the Work, the Contractor shall submit satisfactory evidence that such bonds will be furnished.

(Specify type and penal sum of bonds.)

2. The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

Type | Penal Sum ($0.00)
--- | ---
Payment Bond | |
Performance Bond | |

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

The Contract Bonds shall continue in effect for one year after final acceptance of each contract to protect the Owner’s interest in connection with the one year guarantee of workmanship and materials.
and to assure settlement of claims, for the payment of all bills for labor, materials, and equipment by the Contractor.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

N/A
Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

2022 Fair Minimum Wage Rates
Building 2 Franklin County
(other than 1 or 2 family homes)

<table>
<thead>
<tr>
<th>Occupational Title</th>
<th>Minimum Wage</th>
<th>Minimum Benefit</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickmasons And Blockmasons</td>
<td>$35.00</td>
<td>$0.00</td>
<td>$35.00</td>
</tr>
<tr>
<td>Carpenter</td>
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<td>Carpenters</td>
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<td>$22.13</td>
<td>$5.18</td>
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<td>$34.61</td>
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<td>$20.00</td>
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<td>Crane And Tower Operators</td>
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<td>$5.72</td>
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<td>Mobile Heavy Equipment Mechanics - Except Engines</td>
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<td>$32.37</td>
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<td>Operating Engineers And Other Equipment Operators</td>
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<td>Reinforcing Iron And Rebar Workers</td>
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<td>Tile And Marble Setters</td>
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Welders are classified as the trade to which welding is incidental (e.g. welding structural steel is Structural Iron and Steel Worker)

Apprentices – The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship Council for approved apprenticeship programs.

For any other specific trade on this project not listed above, contact the Bureau of Labor Standards for further clarification.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: ________________

Scott R. Cotnoir
Wage & Hour Director
Bureau of Labor Standards

Expiration Date: 12-31-2022
PART 1 GENERAL

1.01 SUMMARY

A. The work involves the interior renovation of the existing free-standing building at 274 Front Street at location as indicated on Drawings. Work includes, but is not limited to, selective demolition, and addition of exterior doors and windows, concrete pads and patios at exterior door locations, new and reuse of existing roof penetrations. Work also includes metal partitions, insulation, gypsum board walls and ceilings, acoustical ceilings, resilient flooring, carpeting, custom cabinets and fixtures, carpentry, interior glass storefront systems, painting, wood doors, metal doors, metal frames, door hardware, toilet partitions and accessories, signage, fire protection and detection systems, security systems, electrical, heating, ventilation, and air conditioning complete and ready for use.

PART 2 to 3 – Not Used

END OF SECTION 01 11 00
PART 1 GENERAL

1.01 PROJECT CONDITIONS

A. Tobacco Free Campus Policy: On January 1, 2011 the University System adopted a tobacco free campus policy. As of January 1, 2012 compliance with the tobacco free campus policy became mandatory. This paragraph serves as notification to Contractor of the policy and provides the parameters of compliance enforcement. Contractor shall be responsible for notifying its workers and subcontractors regarding the policy and for enforcement of the policy with same. Noncompliance will be managed as follows:

1. First offense – notify Contractor to remind employee and/or subcontractor of policy.
2. Second offense – contractor/subcontractor employee removed from campus for the remainder of the Work.

Additional information regarding the tobacco free campus policy is located at: http://umaine.edu/tobaccofree/

B. Sexual Harassment will not be tolerated on the campuses of the University of Maine System.

C. Weapons and Ammunition are not permitted on the campuses of the University of Maine System.

D. Contractor will be required to provide a site-specific Safety Plan for the project.

E. Contractor will be required to: provide a site specific plan for COVID-19 Safety Measures; required to have all employees and/or subcontractors wear masks while inside any building on Campus; required to follow CDC Guidelines for the project.

F. Contractor parking will be limited to authorized areas defined by the University of Maine System Representative.

PART 2 to 3 – Not Used

END OF SECTION 01 14 00
SECTION 01 21 00
ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes administrative and procedural requirements governing allowances.
      1. Include the cost of allowances in the contract bid price.
   B. Types of allowances include the following:
      1. Quantity allowances.
   C. Related Requirements:
      1. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.2 DEFINITIONS
   A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

1.3 SELECTION AND PURCHASE
   A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
   B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
   C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS
   A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS
   A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

   1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
   4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

   1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
   2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

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

3.3 SCHEDULE OF ALLOWANCES
   A. Allowance #1: Quantity Allowance: Unsuitable Soils. Refer to Section 312316 “Excavation” for allowance for unsuitable soils to be included as part of the civil filed sub-bid.
   B. Allowance #2: Quantity Allowance: Open Rock Removal. Refer to Section 312316.26 “Rock Removal” for allowance for open rock removal to be included as part of the civil filed sub-bid.
   C. Allowance #3: Quantity Allowance: Trench Rock Removal. Refer to Section 312316.26 “Rock Removal” for allowance for trench rock removal to be included as part of the civil filed sub-bid.
   D. Allowance #4: Quantity Allowance: Granular Borrow. Refer to section 312323 “Fill” for allowance for granular borrow to be included as part of the civil filed sub-bid

END OF SECTION
SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section covers those items for which indefinite quantities can be expected and, therefore, pre-agreed prices per unit of work are established as means to determine adjustments to the Contract Price after actual quantities are determined.

1.3 QUANTITIES AND COST ADJUSTMENTS

A. Refer to individual Specification Sections for methods of measurement and payment for unit prices. As soon as the work involved in each unit cost item has been completed, submit documentation to establish the actual quantities provided. Submit to the Architect for review and issuance of Change Order.

B. Change Order amount for each unit cost item will be based on actual quantities multiplied by the unit price. This unit price includes all costs as described below.

1.4 UNIT PRICES

A. Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those required by the Contract Documents, by authorization of the Owner, the below unit prices shall, at the option of the Owner, be the basis of payment to the Contractor or credit to the Owner, for such increase or decrease in the work.

B. The Unit Prices shall represent the exact net amount per unit to be paid the Contractor (in the case of additions or increases) or to be refunded the Owner (in the case of decreases). No additional adjustment will be allowed for materials, installation, substrate preparation, overhead, profit, insurance, general conditions, or other direct or indirect expenses of the Contractor or Subcontractors.

PART 2 - PRODUCTS  [Not Used]

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price No. 1: Installation of flooring underlayment.

1. Description: To be used in areas where floor requires leveling.

2. Unit of Measurement: Square foot flooring requiring underlayment.
END OF SECTION
SECTION 0123 00

ALTERNATES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. For each of the alternates Scheduled at the end of this Section, state the amount in the proposal to be added to or deducted from the Contract Sum for the work.

1.3 ALTERNATES

A. Definition: "Alternates" are alternate products, materials, equipment, systems, methods, units of work or major elements of the construction, which may, at the Owner's option and under the terms established by the Contract or Agreement, be selected for the work in lieu of the corresponding requirements of the Contract Documents. Selection may occur prior to the Contract Date, or may, by the Agreement, be deferred for possible selection at a subsequent date.

B. Alternate Requirements: A Schedule of Alternates is included at the end of this Section. Each alternate is defined using abbreviated language, recognizing that the Contract Documents define the requirements. Coordinate related work to ensure that work affected by each alternate is complete and properly interfaced with work of each selected alternate.

C. Provide written proposals for each alternate on the Bid Form for Owner's consideration. Each proposal amount shall include the entire cost of the alternate portion of the work including overhead, profit, and other costs including cost of interfacing and coordinating the alternate with related and adjacent work.

D. Selection of Alternates: Selection of alternates to be included in the work will be by the Owner.

E. Notification: Immediately following award of Contract, prepare and distribute to each entity a notification of status of each alternate. Indicate which alternates have been accepted, rejected, or deferred for consideration at a later date. Include full description of negotiated modifications to alternates, if any

PART 2 - PRODUCTS  [Not Used]

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1
1. Base Bid: Plastic laminate countertops and backsplash assemblies throughout as scheduled
2. Bid Alternate No. 1 Solid surface countertops and backsplash assemblies throughout

B. Alternate No. 2
1. Base Bid: No exterior canopies
2. Bid Alternate No. 2: Shed style exterior fabric awnings at three exterior doors, see elevations for locations and sizes

C. Alternate No. 3
1. Base Bid: Entry/Waiting Area ceiling to be ACT with 2x2 lights, diffusers, etc.
2. Bid Alternate No. 3: Wood slat ceiling with linear diffusers and lights per drawings

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.2 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"

1.3 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 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. Use CSI Form 13.6D, “Proposal Worksheet Summary,” and Form 13.6C, Proposal Worksheet Detail.” (included at the end of this section for reference)

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 bonds, insurance, 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 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.


1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.5 CHANGE ORDER PROCEDURES


1.6 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
PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. The forms for application for payment, duly notarized, shall be the current authorized edition of the AIA Document G702, Application for Payment, supported by a current authorized edition of AIA G703, Continuation Sheet. Samples of these, and other required AIA documents, are provided in the Contract Documents under Division 00 for informational purposes only.

1.03 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.

1.04 SCHEDULE OF VALUES

A. Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with Continuation Sheets.
   b. Submittals Schedule.
   c. Contractor’s Construction Schedule.

2. Submit the Schedule of Values to Architect prior to the pre-construction meeting.

B. Format and Content: Use the specification 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. Contractor’s name and address.
   d. Date of submittal.

2. Submit draft of AIA G702 Application for Payment form and AIA G703 Continuation Sheet (Schedule of Values) form.

3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers).
   g. Dollar value.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Specification table of contents. Provide several line items for principal subcontract amounts, where appropriate.
Payment Procedures

1. For each line item, provide a sublist breakdown as follows:
   1) Material.
   2) Labor.

5. Documentation: Submit proper documentation for the amounts being requisitioned from subcontractors and material suppliers with each Application for Payment. Three (3) copies of an Application for Payment or a Payment Requisition are required for all subcontracted work. Three (3) copies of the invoice is required for each major supplier.

6. Stored Materials: If Contractor is requesting payment for stored materials as part of the Application for Payment, Contractor must complete Column F in the G703 Continuation Sheet (Schedule of Values) to record the stored materials amounts against line items that pertain to those stored materials. Stored materials are materials or equipment purchased or fabricated and stored, but not yet installed or incorporated into the Work.
   a. Complete and provide three (3) copies of 00 62 79 Stored Materials form with all required documentation. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
   b. Only major long lead delivery items may be considered for off-site storage (example: long lead custom mechanical unit). Standard order and production materials and products shall be delivered to the site before including in Application for Payment of such items.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

8. 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 shall be shown as separate line items in the Schedule of Values.

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

10. Retainage: The required five percent (5%) retainage held per Application for Payment submission shall be accounted for on the G703 on a per line item basis. Each line item with a value in Column G “Total Completed and Stored To Date” shall have a corresponding five percent retainage value entered in Column I.
    a. Final Release of Retainage: The final release of retainage shall be entered as a separate line item on the G703 as “Final Release of Retainage” with the full amount of the five percent retainage entered as a negative number in Column I. The final release of retainage request is submitted as a separate application.

1.05 APPLICATIONS FOR PAYMENT

A. Each 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: G702 Application for Payment shall be submitted to Architect and Owner not less than seven (7) days before monthly progress meeting. The period covered by each Application for Payment is one (1) month, ending on the last day of the month.

C. Payment Application Forms: The Contractor is required under the Contract Documents to use official original AIA documents. Samples of the required documents are provided in Division 00 of the Specifications.

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

E. Transmittal:

1. Submit three (3) signed and notarized originals of:
   a. AIA G702 Application & Certificate for Payment.
   b. AIA G703 Continuation Sheet.
   c. AIA G706 Contractor’s Affidavit of Payment of Debts & Claims.
   d. AIA G706A Contractor’s Affidavit of Release of Liens.
   e. 00 65 19.17 Waiver of Lien.
2. Transmit each Application for Payment with a transmittal form listing attachments and recording appropriate information about submission.

F. Waivers of Mechanic’s Lien: With each Application for Payment, submit three (3) copies of waivers of mechanic’s lien from subcontractors, sub-subcontractors, major suppliers, and every entity who is 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 final waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit 00 65 19.17 Waiver of Lien forms, executed in a manner acceptable to Owner.

G. Certified Payrolls: Wages paid to all workers performing work on the Project shall be in accordance with the Section 00 73 64 Wage Determination Schedule for the Project. Contractor shall submit one (1) copy of each weekly certified payroll for Contractor and all subcontractors, sub-subcontractors, sub-sub-subcontractors, etc. performing work on the Project during the time covered by the Application for Payment. The certified payroll shall be completed in accordance with Section 3.4.4 of the A201 General Conditions and contain the following information:

1. Contractor name.
2. Contractor address.
3. Period number.
4. Week ending date.
5. Employee(s)’s name.
6. Employee(s)’s job title.
7. Employee hourly wage:
   a. Straight time rate.
   b. Overtime rate.
8. Hours worked per day (broken down by straight time and overtime hours).
9. Hours worked per week (broken down by straight time and overtime hours).
10. Total earned for the week:
    a. Straight time.
    b. Overtime.
11. Benefits that form a part of the wage rate.
12. The signature and name of the authorized payroll person.

H. Initial Application for Payment: Administrative actions and submittals that must precede submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor’s Construction Schedule.
5. List of Contractor’s staff assignments.
7. Copies of building permits and other required permits.
11. Insurance verification through submission of insurance certificates, for all Subcontractors.

I. Progress Applications for Payment: Administrative actions and submittals that must precede or coincide with submittal of progress Applications for Payment include the following:

2. Submittals for Work being requisitioned that are complete and approved.
3. Submission of list of completed tests, checklists, commissioning, reports, and similar requirements for the work that are submitted and in compliance with the Contract Documents.
4. Distribution of minutes of previous month’s progress meeting.
5. Current record drawings.

J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion, less retainage, for portion of the Work claimed as substantially complete. Application must:

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. Reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: 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 fees and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA G707 Consent of Surety to Final Payment, three (3) originals.
5. Evidence that claims have been settled.
6. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
7. Final, liquidated damages settlement statement, if a liquidated damages claim has been processed.
8. As-built drawings.
10. Final lien waivers.
11. All training and equipment testing is complete.

PART 2 to 3 – Not Used

END OF SECTION 01 29 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Digital project management procedures.
4. Requests for Information (RFIs).
5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:

1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
4. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 DEFINITIONS

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

B. Days: Consecutive days, as occurring on a calendar, taking into account the day of the week, month, year, and any religious, national or local holidays

C. Work Day: Any day from Monday through Friday.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Within 15 days of starting construction operations, 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.

1.4 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.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical. Coordinate location of pipes, conduits, ducts and similar items in confined areas to assure proper fit and access. Contractor is responsible for handling interferences created by the work of subcontractors (example, sprinkler pipe interfering with installation of duct work; duct work interfering with installation of light fixtures, overhead construction interfering with installation of finish ceilings at proper height).
5. Coordinate the work to provide smoke and fire seals for component interfaces and penetrations of smoke walls and fire rated construction.

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.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUPERVISORY AND ADMINISTRATIVE PERSONNEL

A. Superintendent: Provide a qualified fulltime superintendent who is on site whenever work is being performed.

B. Other Staff: Provide other qualified supervisory and administrative personnel as required for proper performance of the work.

1.6 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings for areas indicated, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Provide Coordination Drawings for Auditorium and Stage. Intent is to provide coordination with locations of all building structure, walls, utilities, stage and audio equipment, and Architectural elements.

2. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

   a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.

   b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.

   c. Indicate functional and spatial relationships of components of architectural, structural, mechanical, and electrical systems.

   d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.
g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Acoustical Ceilings and Panels: Show the following:
   a. Locations of each ceiling and acoustical panel types.
4. Stage Curtains, Rigging, and Mounted Equipment: Show the following:
   a. Locations of stage curtains, rigging and support components, and equipment mounted to walls or ceiling.
5. Fire-Protection System: Show the following:
   a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
6. Mechanical and Plumbing Work: Show the following:
   a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
   b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
   c. Fire-rated enclosures around ductwork.
7. Electrical Work: Show the following:
   a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
   b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
   c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
   d. Location of pull boxes and junction boxes, dimensioned from column center lines.
8. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's
responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.

9. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

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.
3. No work should proceed where there is an unresolved conflict in the contract documents. If there are conflicting details or requirements the Contractor must resolve them with the Design Team before proceeding with the work.

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.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Architect's response for each RFI will be returned as soon as possible.
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 012600 "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 10 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. Software log with not less than 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 seven days if Contractor disagrees with response.
   1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
   2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Web-Based Project Software: Provide, administer, and use web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.
   1. Web-based Project software site includes, at a minimum, the following features:
      a. Compilation of Project data, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
c. Document workflow planning, allowing customization of workflow between project entities.
d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to the following:
   1) RFIs,
   2) Action/Information/Closeout submittals,
      a) Including deficiency/correction punch list
      b) Operations and Maintenance manuals.
      c) Electronic record and photographs of physical samples and color selection charts
   3) Mock-ups: electronic record and photographs of mock-up, and when specified, field test results of mock-up.
   4) Minor Changes in the Work,
   5) Construction Change Directives, and
   6) Change Orders.
e. Track status of each Project communication in real time, and log time and date when responses are provided.
   1) The tracking systems must be customizable to accommodate durations, turn around times, and dates specified in the bidding documents
f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
g. Processing and tracking of payment applications.
h. Processing and tracking of contract modifications.
i. Creating and distributing meeting minutes.
j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
k. Management of construction progress photographs.
l. Mobile device compatibility, including smartphones and tablets.
m. Additional features supported:
   1) Location to store and upload Field reports and meeting minutes
      a) Function to edit, provide comments or remarks, or upload revisions of documents.
2. Provide up to seven web-based Project software user licenses for use of Owner, Owner's Commissioning Authority, Architect, and Architect's consultants. Provide eight hours of web-based software training for Project software users.
3. Users of the service require an e-mail address, internet access, and PDF review software with the ability to mark-up/redline, apply electronic stamps, and flatten/secure PDFs.
   a. PDF functionality requirements may be waived if the Project Management software has those features.
4. At completion of Project, provide digital archive in format that is readable by common
desktop software applications in format acceptable to Architect. Provide data in locked
format to prevent further changes.

5. Paper document or electronically mailed (e-mail) transmittals will not be reviewed when
Project Management Software is part of the project delivery.

6. Provide one of the following web-based Project software packages under their current
published licensing agreements:
   a. Autodesk; Buzzsaw or Constructware.
   b. Corecon Technologies, Inc.
   c. Meridian Systems; Prolog.
   d. Newforma, Inc.
   e. Procore Technologies, Inc.
   g. Submittal Exchange.
   h. EADOC LLC
   i. Onware Inc.

1.9 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 work days of the meeting.

B. Preconstruction Conference: 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, Owner's Commissioning Authority,
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. Responsibilities and personnel assignments.
   b. Tentative construction schedule.
   c. Phasing.
   d. Critical work sequencing and long-lead items.
   e. Designation of key personnel and their duties.
   f. Lines of communications.
   g. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFI.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Preparation of record documents.
o. Use of the premises and existing building.
p. Work restrictions.
q. Working hours.
r. Owner's occupancy requirements.
s. Responsibility for temporary facilities and controls.
t. Procedures for moisture and mold control.
u. Procedures for disruptions and shutdowns.
v. Construction waste management and recycling.
w. Parking availability.
x. Office, work, and storage areas.
y. Equipment deliveries and priorities.
z. First aid.
bb. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Commissioning Authority of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

b. Options.
c. Related RFI.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.

2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

   a. Preparation of record documents.
   b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
   c. Submittal of written warranties.
   d. Requirements for preparing operations and maintenance data.
   e. Requirements for delivery of material samples, attic stock, and spare parts.
   f. Requirements for demonstration and training.
   g. Preparation of Contractor's punch list.
   h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
   i. Submittal procedures.
   j. Coordination of separate contracts.
   k. Owner's partial occupancy requirements.
   l. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority 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. Application for Payment: Contractor shall bring copy of Application for Payment to meeting. Review Application for Payment and required attachments, including record drawing and documents status, waivers of mechanic's liens, list of completed tests, checklists, commissioning, reports, and similar requirements for the work are submitted and in compliance with the Contract Documents.

   c. 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.
F. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner, Owner's Commissioning Authority 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

   a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

   b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.

   c. Review present and future needs of each contractor present, including the following:

      1) Interface requirements.
      2) Sequence of operations.
      3) Status of submittals.
      4) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Work hours.
     10) Hazards and risks.
     11) Progress cleaning.
     12) Quality and work standards.
     13) Change Orders.

3. Conduct coordination meetings with the mechanical, plumbing, sprinkler and electrical trades. Before the trades start work in an area of the building, make field measurements, review structural clearances and locations of ducts, pipes, conduits, light fixtures, equipment and other items that affect location and proper fit. Prepare coordination sketches to maximize utilization of space for efficient installation of different components. Verify depths and clearances before fabrication of ductwork.

4. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

1.2 DEFINITIONS

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

1. Critical 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.

B. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

C. Event: The starting or ending point of an activity.

D. Float: The measure of leeway in starting and completing an activity.

E. Days: Consecutive days, as occurring on a calendar, taking into account the day of the week, month, year, and any religious, national or local holidays.

F. Work Day: Any day from Monday through Friday.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Startup construction schedule.
C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

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

E. Daily Construction Reports: Submit at weekly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

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

I. Qualification Data: For scheduling consultant.

1.4 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Discuss constraints, including phasing, work stages, area separations and milestones.
2. Review delivery dates for Owner-furnished products.
3. Review submittal requirements and procedures.
4. Review time required for review of submittals and resubmittals.
5. Review requirements for tests and inspections by independent testing and inspecting agencies.
6. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
7. Review and finalize list of construction activities to be included in schedule.
8. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, 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.
3. Allow for time in the construction schedule for materials to dry before they are enclosed to prevent the growth of mold and bacteria.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final 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 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
5. Commissioning Time: Include no fewer than 15 days for commissioning.
6. 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.
7. Punch List and Final Completion: Include not more than 30 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. Phasing: Arrange list of activities on schedule by phase.
2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   g. Seasonal variations.
   h. Environmental control.
4. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Startup and placement into final use and operation.
m. Commissioning.

5. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

1. Temporary enclosure and space conditioning.

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

F. 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.

G. 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.
1.7 STARTUP CONSTRUCTION SCHEDULE

A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 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.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.9 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. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events (see special reports).
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.
B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. 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 Interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

1.10 SPECIAL REPORTS

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

B. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one work day of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Submittal schedule requirements.
   2. Administrative and procedural requirements for submittals.

B. Related Requirements:
   1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
   2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
   3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
   4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
   5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
   6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
   7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   8. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

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. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Material Submittal List: A document prepared by the Architect, and attached to the end of this section, that lists the anticipated submittals required for this project. This is a checklist for use by the Architect but may also be used by the Contractor as a guide to help with the submittal process.

D. Days: Consecutive days, as occurring on a calendar, taking into account the day of the week, month, year, and any religious, national or local holidays
E. Work Day: Any day from Monday through Friday.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Submittals shall be scheduled in an orderly fashion that spreads the submissions out over a period of time to permit Architect adequate opportunity to schedule personnel for timely reviews. Where submittals are not required to be submitted concurrently, or do not require coordination with other submittals, Contractor shall review, stamp, and submit as submittals are received. Contractor shall not receive submittals, hold them, and then release them to the Architect all at once.
3. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
4. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
   a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
5. Format: Arrange the following information in a tabular format:
   a. Scheduled date for first submittal.
   b. Specification Section number and title.
   c. Submittal category: Action; informational.
   d. Name of subcontractor.
   e. Identify each item with a description of the Work covered.
   f. Scheduled date for Architect's final release or approval.
   g. Scheduled date of fabrication.
   h. Scheduled dates for purchasing.
   i. Scheduled dates for installation.
   j. Activity or event number.

B. Arrange to have all submittals processed to the Architect within 90 days. Submittals received after this time frame and not identified and agreed to by the Architect on the submittal schedule will not be subject to the 28 day submittal review period.

C. No submittals shall be reviewed until the entire submittal schedule has been submitted to the Architect.
1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
4. Name of Contractor.
5. Name of firm or entity that prepared submittal.
6. Names of subcontractor, manufacturer, and supplier.
7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
   a. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., ABCD-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., ABCD-061000.01.A).
8. Category and type of submittal.
10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
11. Drawing number and detail references, as appropriate.
12. Indication of full or partial submittal.
13. Location(s) where product is to be installed, as appropriate.
14. Other necessary identification.
15. Remarks.
16. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number. The only exception to this is the color charts which will be sent as hard copies in the mail. No photo copies or PDF copies of color charts will be acceptable.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

B. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals, if requested.

2. Contractors requesting files shall sign the “Electronic Files Request Form and Waiver” and submit agreement included at the end of this section.

C. 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 all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

5. Every Product must be submitted within the Section Name and heading to match the Section in which it is written. No mixing of Sections or submitting under different Section Titles

D. 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. Initial Review: Allow 20 work days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 20 work days for review of each resubmittal.
4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 5 additional work days for initial review of each submittal.

a. Sitework submittals.
b. Commercial equipment submittals.
c. Structural submittals.
d. Mechanical submittals.
e. Electrical submittals.
f. Data & Communications Systems submittals.

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

6. Submittals with color selection: The Contractor shall deliver to Architect a list of submittals for the interior color package and a list for the exterior color package. The Contractor shall deliver all items for exterior color selection at one time. The Architect needs to coordinate the colors of all exterior items and the Contractor shall allow 4 weeks for return of exterior color selections. The Contractor shall deliver all items for interior color selection at the same time. The Architect needs to coordinate the colors of all interior items and the Contractor shall allow 6 weeks for return of interior color selections.

E. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

G. 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.

1.6 SUBMITTAL REQUIREMENTS

A. 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. Mark with dark colored pen that permits photocopying.
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. Manufacturer’s Safety and Data Sheets (MSDS).
   h. Notation of coordination requirements.
   i. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of 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. PDF electronic file.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
   a. Project name and submittal number.
   b. Generic description of Sample.
   c. Product name and name of manufacturer.
   d. Sample source.
   e. Number and title of applicable Specification Section.
   f. Specification paragraph number and generic name of each item.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.

b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. 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.

E. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.

F. Certificates:

   1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.

   2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

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

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


G. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

2. 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.

3. 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.

4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

5. 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.

6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

   a. Name of evaluation organization.
   b. Date of evaluation.
   c. Time period when report is in effect.
   d. Product and manufacturers' names.
   e. Description of product.
   f. Test procedures and results.
   g. Limitations of use.

1.7 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

1.8 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.

1. The Contractor shall review submittals for completeness and compliance with the Contract Documents. If submittal contains substitutions, Contractor shall process substitutions in accordance with Section 012500 “Substitution Procedures,” and not part of specified Shop Drawings or Product Data submittals. Contractor is responsible for keeping Subcontractors on time with the submittal schedule. Submittals that are rejected twice due to incompleteness or failure to incorporate prior submittal comments from the Design Team will be reviewed thereafter at the expense of the Contractor. Compensation will be through credits back to the Owner in the amount of the Architect’s services. The Architect will track hours separately related to this compensable submittal review and credits will be managed through Pay Requisitions.

a. Owner will compensate Architect for such additional services.
b. Owner will deduct the amount of such compensation from Payment Requisitions.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and 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.

1. Stamp or statement shall include the following: "The Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.”
1.9 ARCHITECT’S ACTION

A. Action Submittals: Architect will review each submittal, provide a cover sheet with marks to indicate corrections or modifications required, and return it. Architect will provide a cover sheet with each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Reviewed: Final Unrestricted Release. Work may proceed, provided it complies with the Contract Documents.
2. Furnish as Corrected: Final But Conditional Release. Work may proceed, provided it complies with the notations and corrections on submittals and with Contract Documents. Architect's comments shall be considered a part of the original submittal. Should Contractor disagree with any such comments, so notify the Architect within ten (10) work days after receipt of such transmittal and before commencing work on the items in question. Failing this, Contractor shall be deemed to have agreed to such comments by the Architect and to have accepted full responsibility for implementing them at no additional cost to the Owner.
3. Revise and Resubmit: Returned for Resubmittal. Do not proceed with the work at the site or allow submittal at site. Fabrication in shop or factory may proceed on items not affected by the Architect's comments only. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking. Revise and Resubmit
5. Rejected: Where submittal is returned for other reasons, with Architect's explanation included.

B. 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.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
SECTION 01 33 00.1
ELECTRONIC RELEASE

Date: [Date]

To/Company:

Project:
RE: Transfer and use of electronic 3D model file

[Contractors Representative]:

At your request CHA Architecture will provide electronic files for your convenience and use in performing your work relating to the above referenced project, subject to the following terms and conditions:

1. Our electronic files are compatible with the specific software and hardware in use at CHA Architecture's office. CHA Architecture makes no representation as to the compatibility of these files with your software or your hardware.

2. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data’s creator, the party receiving electronic data agrees that it will perform acceptance tests upon receipt, after which the receiving party shall be deemed to have accepted the data. CHA Architecture makes no representations to the Recipient or others as to the long-term usability or readability of electronic media or of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the creating party.

3. The electronic files contain a 3D model prepared in the current version of Revit. The model is not and does not represent or imply construction documents. As a model, it is subject to change as the project proceeds. The construction requirements of the project will not be determined until the final construction documents are issued as 2D electronic files or paper copies. Any use of the 3D model for construction purposes is at the sole risk of the user and in violation of this agreement.

4. Since the electronic 3D model is intended for the sole purpose of CHA Architecture developing its ongoing work, use of the model in determining estimating quantities or conditions shall be at the sole risk of the estimator.

5. Data contained on these electronic files are part of our instruments of service and shall not be used by [Contractor] or anyone else receiving these data through or from [Contractor] for any purpose other than as a convenience in your performing preconstruction services. Any other use or reuse by [Contractor] or by others will be at [Contractor] sole risk and without liability or legal exposure to CHA Architecture. [Contractor] agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against CHA Architecture, its officers, directors, employees, agents or subcontractors that may arise out of or in connection with [Contractor] use of the electronic files.

6. In the event that [Contractor] 's or its subcontractors, or anyone for whom [Contractor] is legally liable makes or permits to be made any changes to the 3D model without obtaining our written consent, [Contractor] shall assume full responsibility for the results of such changes. Therefore, [Contractor] agrees to waive any claim against CHA Architecture and to release CHA Architecture from any liability arising directly or indirectly from such changes.
7. Furthermore, [Contractor] shall, to the fullest extent permitted by law, indemnify and hold CHA Architecture harmless against all damages, liabilities or costs, including reasonable attorney’s fees and defense costs, arising out of or resulting from [Contractor] ’s use of these electronic files.

8. Under no circumstances shall delivery of the electronic files for use by [Contractor] be deemed a sale by CHA Architecture.

Accepted by:

[Contractors Representative]  Date:
PART 1 - GENERAL

1.1 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 are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

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

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

   4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

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

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

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

   1. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. 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.

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

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. 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).

J. 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.

1.3 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.4 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 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
   1. Indicate manufacturer and model number of individual components.
   2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. 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.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
   1. Specification Section number and title.
   2. Entity responsible for performing tests and inspections.
   3. Description of test and inspection.
   4. Identification of applicable standards.
   5. Identification of test and inspection methods.
   6. Number of tests and inspections required.
   7. Time schedule or time span for tests and inspections.
   8. Requirements for obtaining samples.
   9. Unique characteristics of each quality-control service.

E. Reports: Prepare and submit certified written reports and documents as specified.

F. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.
A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award or Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

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.

1.8 REPORTS AND DOCUMENTS
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.

1.9 QUALITY ASSURANCE

A. General: 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. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 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.

H. 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.

I. 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.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

f. When testing is complete, remove test specimens, assemblies, and mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and 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.

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. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect, Commissioning Authority, 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.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services
as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. 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 inspection 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.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.
PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

   1. Provide materials and comply with installation requirements specified in other Specification Sections 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 017300 "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 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.

J. Substantial Completion: Refer to Section 3-A Standard General Conditions.

1.2 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.

1.3 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 indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.

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.
4. DOE - Department of Energy; www.energy.gov.
5. EPA - Environmental Protection Agency; www.epa.gov.
6. OSHA - Occupational Safety & Health Administration; www.osha.gov.
7. USDA - Department of Agriculture; Rural Utilities Service; www.usda.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. USAB - United States Access Board; www.access-board.gov.
2. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

E. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
1. DOE - State of Maine Department of Education.
2. MDEP - State of Maine Department of Environmental Protection.
3. MDOT - State of Maine Department of Transportation

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:
   1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.
   2. Section 312319 "Dewatering" for disposal of ground water at Project site.

C. Work Not Included In This Section:
   1. Refer to Filed Sub-Bid sections for temporary heating and protection requirement for masonry and sitework concrete that will be part of the filed sub-bid scope of work.

1.2 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

E. Heating Fuel: Fuel required for temporary heating will be the responsibility of the Contractor, except as indicated for Filed Sub-Bid work.

F. Telephone Service: Pay installation, service and use charges for telephone usage, by Contractor, at Project site.

G. Internet Service: Pay installation, service and use charges for internet usage, by Contractor, at Project site.
1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

D. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.

E. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
   1. Locations of dust-control partitions at each phase of work.
   2. HVAC system isolation schematic drawing.
   3. Location of proposed air-filtration system discharge.
   5. Other dust-control measures.

F. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements to protect install concrete and masonry.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Frost Protection: Protect footings and slabs from freezing temperatures and prevent frost from occurring beneath footings and slabs. Frozen water found on soil or concrete surface shall be reason for rejection of protection method. Provide corrective measures within 24 hours after
notice of condition is given. Evidence of frost at these locations shall be reason for rejection, removal, and replacement at no additional cost to the Owner.

C. Use of new heating or cooling systems, during the construction period, will not be allowed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts.

B. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry."

C. Gypsum Board: Minimum 1/2 inch thick by 48 inches wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C36/C36M.

D. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E84 and passing NFPA 701 Test Method 2.

E. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

F. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.

2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot square tack and marker boards.

3. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.

4. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Clerk of Work Field Office: Provide an insulated, weathertight, air-conditioned field office for use by Owner’s Representative and the Clerk of Works. Provide single unit of at least 8’ x 16’.
1. Duration:
   a. Within 2 weeks of notice of award of contract until Substantial Completion.

2. Furnish and equip each separate office as follows:
   a. Desk and four chairs, four-drawer file cabinet, a plan table, a plan rack, and bookcase.
   b. Provide office with internet access.

3. Provide a heater with thermostat capable of maintaining a uniform indoor temperature of 68 deg F. Provide an air-conditioning unit capable of maintaining an indoor temperature of 72 deg F.

4. Provide fluorescent light fixtures capable of maintaining average illumination of 20 fc at desk height. Provide 110- to 120-V duplex outlets spaced at not more than 12-foot intervals, 1 per wall in each room.

D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control. Heaters shall be located outside the building and combustion gases shall be vented outside the building. Maintain observation of units in operation.
   1. Use of gasoline-burning space heaters, interior open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

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

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

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. Temporary Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

   a. Refer to Divisions 02 through 48 for additional temporary heat, ventilation, and humidity requirements for products in those Sections.”

2. Provide temporary heat to protect all concrete and masonry work during installation as well as other trades needing specific heat requirements to perform and protect their work. See individual specification sections for detailed information.

3. All concrete slabs on grade, footings and foundations not below the frost line shall be protected from freezing either by heating or protecting with insulation until substantial completion.
F. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

2. It shall be the General Contractor's responsibility to provide dehumidifiers or humidifiers required to perform the installation of wood floors.

3. All spaces shall be mechanically ventilated to protect occupants from application and installation of odor causing materials. The area where odor-causing material is being used shall be isolated from the new and existing ventilation system.

4. Negative pressure shall be maintained within the construction areas inside the existing building to prevent the spread of dust and odors. Route ductwork from the negative-air fans to the exterior of the building, filtering the air in the duct prior to being discharged, by means of a standard furnace air filter. The negative air pressure system shall be activated prior to the commencement of work each day, and remain operating until one-half hour after the stop of work for each day.

5. No work creating fumes shall be done in occupied areas of existing building while it is occupied by the Owner. Ventilation shall be maintained for a period of 24 hours or until release of fumes has subsided, whichever is longer.

6. The permanent ventilation system shall be fully operational and run full time for a minimum of 2 weeks before date established for Substantial Completion. Cost of operation shall be included as part of the work.

H. Electric Power Service: Refer to Division 26 for requirements.

I. Lighting: Refer to Division 26 for requirements.

J. Telephone Service: Provide temporary cellular telephone service with voice mail throughout construction period.

K. Internet Service: Provide high-speed internet service to Clerk-of-the-Works field office.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
B. Temporary Roads and Parking Areas: Construct and maintain temporary roads and parking areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and parking areas within construction limits indicated on Drawings.

1. Provide a reasonably level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the top 6 inches.
2. Provide gravel paving course of subbase material not less than 3 inches thick; roller compacted to a level, smooth, dense surface.
3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. 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.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.

1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

F. 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 017300 "Execution."

G. 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.

H. Temporary Elevator Use: Use of elevators is not permitted.

I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

J. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.
3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

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 011000 "Summary."

C. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Section 315713 "Slope Protection and Erosion Control"

1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As indicated on Drawings.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

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

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

1. Prohibit smoking in construction areas.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary heating system, or permanent HVAC system if allowed by Owner, to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
   
a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
   
b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
   
c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION
PART 1 - GENERAL

1.1 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; and special warranties.

B. Related Requirements:
   1. Section 012100 "Allowances" for products selected under an allowance.
   2. Section 012300 "Alternates" for products selected under an alternate.
   3. Section 012500 "Substitution Procedures" for requests for substitutions.
   4. Section 014200 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
   2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating equal products of additional manufacturers named in the specification.

D. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a substitution request, if applicable.
1.3 ACTION SUBMITTALS

A. General Contractor to submit certification that no asbestos containing materials have been used in the construction of this project, in conformance to AHERA (Asbestos Hazard Emergency Response Act).

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.

1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
   a. Name of product and manufacturer.
   b. Model and serial number.
   c. Capacity.
   d. Speed.
   e. Ratings.
3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

C. Products with asbestos: Asbestos containing materials are not to be purchased or installed in this project. Comply with AHERA (Asbestos Hazard Emergency Response Act) and provide certification that no asbestos containing materials have been used in the construction of this project.

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.

D. During the construction process, meet or exceed the following minimum requirements to prevent the growth of mold and bacteria:

1. Keep building materials dry. Wood, porous insulation, paper, fabric, and similar absorptive materials shall be kept dry to prevent the growth of mold and bacteria. Cover these materials to prevent rain damage, and if resting on the ground, use spacers to allow air to circulate between the ground and the materials.

2. Replace water-damaged materials, or dry within 24 hours, due to the possibility of mold and bacterial growth. Materials that are damp or wet for more than 24 hours shall be discarded if evidence of mold occurs.

3. Immediately remove materials showing signs of mold and mildew, including materials with exposed moisture stains, from the site and properly dispose of them. Replace moldy materials with new, undamaged materials.

4. Require that moisture sensitive materials be delivered dry and protected from the elements.

5. Allow for time in the construction schedule for materials to dry before they are enclosed.

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.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
6. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved substitute" or approved," comply with provisions in "Product Substitutions" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Substitutions will not be considered.
   a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Substitutions will not be considered.
   a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product.
   a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"

4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
   a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: …"

5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product.
   a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: …"

6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
   a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: …"

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or an equal product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in Division 01 Section "Substitution Procedures" for consideration of an unnamed product or manufacturer.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
   1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
PART 3 - EXECUTION (Not Used)

END OF SECTION
No substitutions will be considered without this completed substitution request form and supporting documentation. Substitutions made without completion of this form will be considered defective work as stated in AIA A201.

| Date: | ______________________ | Number: | __________ |
| Re: | Request for Substitution |

The Contractor proposes the following substitution in accordance with the requirements of the Contract Documents:

| Scope of Substitution |  |
| Specification Reference |  |
| Drawing Reference |  |
| Reason for Proposed Substitution |  |
| Benefit to Owner |  |
| Impact on Project Cost |  |
| Impact on Project Schedule |  |
| Impact on Guarantees and Warranties |  |
| Coordination and Compatibility Required with Adjacent Materials and System |  |
| List Deviations From Specified |  |
Requirements

Attachments: Attach supporting documentation sufficient for Architect to evaluate substitution. Substitution Request Forms submitted without adequate documentation will be returned without review.

Response Date: List date by which response by Architect is requested to maintain project schedule and allow sufficient time for inclusion of proposed substitution.

Submitted By

Firm and Address

Signature below signifies acceptance of responsibility for accuracy and completeness of information included in this Substitution Request Form.

Authorized Signature
ARCHITECT'S RESPONSE

Notations listed below shall have same meaning as on Architect's approval stamp. Clarifications to or changes in project schedule or time shall be processed using standard project forms.

Architect's Response

- [ ] Approved
- [ ] Approved as Corrected
- [ ] Revise and Resubmit
- [ ] Rejected
- [ ] Returned Without Review

Remarks

_________________________________________________

_________________________________________________

_________________________________________________

_________________________________________________

Date

_________________________________________________

Signed

_________________________________________________

END OF FORM
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 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.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit two copies signed by land surveyor.

D. Final Property Survey: Submit 2 copies showing the Work performed and record survey data.
1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

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

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. 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.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Anchors and Fasteners: provide anchors and fasteners and required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: where mounting heights are not indicated, mount components at heights directed by Consultant.
   2. Allow for building movement, including thermal expansion and contraction and acoustic isolation between construction systems (AIC and AIJ).
   3. Coordinate installation of anchorages. Furnishes setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
   4. Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless otherwise indicated.
   5. Prevent electrolytic action between dissimilar metal and materials.
   6. Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
   7. Keep expose fastenings to a minimum, space evenly and install neatly.
   8. Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
   9. Use non-corrosive, hot-dipped galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in the affected specification section.

I. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

J. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
K. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: 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 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as
practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

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

3.7 PROGRESS CLEANING

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

   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
      a. Use containers intended for holding waste materials of type to be stored.
   4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.
C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
   a. Clean interior spaces prior to the start of finish painting, and continue cleaning on an as-needed basis until painting is finished.
   b. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3. Remove materials and debris that create tripping hazards.

D. For general construction, each trade shall pick up the debris and rubbish, generated by that trade, and dispose of in dumpsters furnished by the General Contractor.

E. 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.

F. Concealed Spaces: Remove dirt, debris and garbage from concealed spaces, including stud cavities before enclosing the space.

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

H. 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 015000 "Temporary Facilities and Controls."

I. 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.

J. 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.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

C. Protect resilient flooring against marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by flooring manufacturer.

1. Cover products installed on floor surfaces with undyed, untreated building paper until inspection for Substantial Completion.

2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

D. Protect roofing materials against cuts, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period.

1. Do not move heavy and sharp objects directly over roof surfaces. Place plywood or hardboard panels over roofing and under objects while they are being moved. Slide or roll objects over panels without moving panels.

E. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification. Replace or repair damaged labels to Architect’s satisfaction or replace component if label cannot be repaired or replaced.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 SUMMARY

A. This Section includes requirements for the Contractor's implementation of waste management controls and systems for the duration of the Work.

B. Construction and Demolition Waste Management Planning: Develop a waste management plan, quantifying material diversion by either weight or volume to recycle and/or salvage non-hazardous construction and demolition debris.

1. Exclude excavated soil and land-clearing debris from calculations.
2. Diverted waste includes recycled, salvaged, reused, and donated materials.
3. Include materials destined for alternative daily cover (ADC) in the calculations as waste (not diversion).
4. Include wood waste converted to fuel (bio-fuel) in the calculations as diversion. Other types of waste-to-energy are not considered diversion for this credit.

C. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 011000 - GENERAL REQUIREMENTS for general submittal requirements.
2. Section 024100 - DEMOLITION for demolition, salvage, and reuse requirements.

1.3 INTENT

A. The Owner and Architect have established that this Project shall generate the least amount of waste practical and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.

1. With regard to these goals the Contractor shall develop, for the Architect's review, a Waste Management Plan (WMP) for this Project.

   a. Include both demolition and construction waste management.

2. Each Subcontractor shall be responsible for segregating their own waste into different dumpsters as directed by the Contractor.
3. Source Separation, Definition: Source separated construction or demolition waste materials that are sorted into separate bins on the project site (aka on-site).

   a. This waste strategy often isolates waste materials targeted for reuse, donation, or recycling programs.
b. Typically, sorted materials on-site include metals, wood, ceiling tiles, furniture, and concrete.

B. Contractor shall be responsible for ensuring that debris will be disposed of at appropriately designated licensed solid waste disposal facilities, as defined by local authorities having jurisdiction.

C. Hazardous Wastes: Any unforeseen hazardous wastes shall be separated, stored, and disposed of according to local regulations and as directed by the Owner. Hazardous wastes shall not be included in diversion calculations.

1.4 SUBMITTALS

A. Waste Management Progress Reports: Concurrent with each Application for Payment, submit a written Waste Management Progress Report in the same format as required for Final Report.

B. Waste Management Final Report: Prior to Substantial Completion, submit a written Waste Management Final Report summarizing the types and quantities of materials recycled and disposed of under the Waste Management Plan. Include the name and location of disposal facilities. Quantity may be measured by either weight or volume; be consistent in calculations. Include the following:

1. Material category, including source separated material streams.
2. Generation point of waste.
3. Total quantity of waste, by weight.
4. Quantity of waste salvaged, both estimated and actual.
5. Quantity of waste recycled, both estimated and actual.
6. Total quantity of waste diverted (salvaged plus recycled).
7. Total quantity of waste diverted (salvaged plus recycled) as a percentage of total waste.

C. Other Submittals:

1. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
2. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
3. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
4. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, and/or receipts.
5. 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.

D. Commingling Waste Vendor Submittals: Provide annual report from local or state government authority and summary attachment of diverted materials with the average annual recycling rate. Figures in the summary must be derived from the annual reports in concise clear language.

1. Commingling waste shall be considered one material stream.
2. Provide tipping invoices for commingled waste and the following:

   a. Vendor’s most recent annual report from local or state government authority.
b. Vendor’s annual report summary attachment of diverted materials in tonnage, with the average annual recycling rate and percent ADC.

3. If Wood Derived Fuel (WDF) was listed as a diverted material in the above, vendors shall furnish a letter from the biomass plant stating their DOE operating permit number and that WDF was received from vendor, for the same year as the annual report.

1.5 CONTRACTORS

A. Contractor may subcontract work of this Section to a sub-contractor specializing in recycling and salvaging of construction waste.

B. Gypsum Wallboard Recycling: New, paper-faced gypsum wallboard scrap (cuts from construction - not demolition waste) generated at project may be recycled by Cambridge Gypsum Recycling, Grafton, MA (508-868-9664).

C. Acoustical Ceiling Panel Recycling: Demolition and construction waste pulpable mineral fiber ceiling panels may be recycled by Armstrong World Industries and US Gypsum. Contact Armstrong at 1-877-ARMSTRONG (1-877-276-7876) or www.armstrongceilings.com/recycling or contact USG at 1-800-USG-4YOU (1-800-874-4968 x2) or www.usgdesignstudio.com, to coordinate recycling efforts, apply for product approvals, and receive reclamation procedure requirements.

D. Carpet Recycling: Demolition and construction waste carpet and carpet padding may be recycled by Carpet America Recovery Effort (CARE). Visit www.carpetrecovery.org to locate carpet reclaimers in local project area and reclamation procedure requirements.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement Waste Management Plan as approved by the Architect. Provide containers, storage, signage, transportation, and other items as required to implement WMP for the entire duration of the Contract.

1. Deliver waste directly to construction and demolition handling facilities. Do not deliver to transfer stations.

B. Commingling Waste: Commingling waste at the job site may be allowed, provided that the following conditions are met:

1. Comminglers shall be included in the Waste Management Plan (WMP).
2. Additional comminglers must be pre-approved by the Architect via WMP addenda, prior to tipping on the job site.

3.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: The Contractor shall designate an on-site person responsible for instructing workers and overseeing and documenting results of the Waste Management Plan for the Project.
B. Distribution: The Contractor shall distribute copies of the Waste Management Plan to the Job Site Foreman, each Subcontractor, the Owner and the Architect.

C. Instruction: The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

D. Separation Facilities: The Contractor shall lay out and label a specific area to facilitate separation of materials for recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials. Location shall be acceptable to the Architect.

1. Commingling: Waste commingling shall be approved prior to jobsite tipping, per requirements of this Section.
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion.
2. Architect’s Review.
3. Final Completion.
4. Warranties.
5. Final cleaning.

B. Related Requirements:

1. Section 012900 “Payment Procedures” for Application for Payment and Final Completion.
2. Section 013100 “Project Management and Coordination” for Project Closeout Meeting.
3. Section 017300 "Execution" for progress cleaning of Project site.
4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
6. Section 017900 “Demonstration and Training” for requirements for instructing Owner’s personnel.
7. Division 02 through 33 Sections for specific closeout and special cleaning requirements.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor’s List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. As required per Division 01 through 33 Section.

1.4 SCHEDULE

A. Contractor shall include on Project Schedule start and completion dates for Substantial Completion, Architect’s review and Final Completion.
B. Architect shall be provided a minimum of ten working days for each review after receipt of request.

C. Closeout shall successfully conclude prior to Date of Completion.

1.5 SUBSTANTIAL COMPLETION

A. Complete and submit the following a minimum of ten days prior to requesting Architect’s Review to determine the date of Substantial Completion. Items shall be complete.

1. Prepare and submit a punch list of items to be completed or corrected. Include a value of the work and the reason why it is incomplete or needs correction.

2. 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.

   a. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   b. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   c. Include the following information at the top of each page:

      1) Project name.
      2) Date.
      3) Name of Architect.
      4) Name of Contractor.
      5) Page number.

3. Advise Owner in writing of pending insurance change over requirements.

4. Prepare and submit closeout submittals specified in Division 1, including but not limited to warranties, record documents, and manuals.

5. Submit closeout submittals specified in individual Sections, including but not limited to warranties, workmanship bonds, maintenance service agreements, certifications, and similar documents.

6. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities, including but not limited to Certificate of Occupancy, approvals of public and private entities having jurisdiction, operating certificates and completion of commissioning.

7. Prepare and submit a Schedule of Maintenance Materials specified in individual Sections. Maintenance Materials including but are not limited to extra materials, tools, and spare parts. Schedule shall identify Specification Section, item name, quantity and manufacturer’s information including contact information, item identification, data sheets and special storage requirements.

8. Submit test/adjust/balance reports including a notarized letter from the Contractor indicating that all systems are complete.

9. Make final changeover of permanent locks and deliver keys to Owner with a list indicating which key opens which lock(s) utilizing final room numbering.

10. Instruct Owner’s personnel in operation, adjustment and maintenance of products, equipment and systems. Submit documentation that Owner training has been successfully completed.
11. Advise Owner in writing of utility changeovers.
12. Participate with Owner’s personnel in conducting inspection and walkthrough with local emergency responders.
13. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
14. Complete final cleaning requirements, including touch-up paint.
15. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

1.6 ARCHITECT’S REVIEW

A. Submit a written request for the Architect’s Review to determine the date of Substantial Completion. Contractor shall have completed the requirements of Substantial Completion a minimum of ten days prior to this request.

1. Architect will either proceed with the Review or notify the Contractor of unfulfilled requirements.
2. When the Architect proceeds, they will review the Project and submit a punch list of items that are incomplete and/or requiring correction. The punch list will be provided as a PDF electronic file.
3. Along with the punch list the Architect shall issue the Certificate of Substantial Completion or indicate to the Contractor what items must be completed on the provided Punch List before it will be issued.
4. The date that the Certificate of Substantial Completion is issued shall be the start date of the warranty periods specified.

1.7 FINAL COMPLETION

A. Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 “Payment Procedures.”
2. Submit certified copy of Architect's 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.
4. Provide documentation that all items on the Schedule of Maintenance Materials have been provided.

B. Inspection: Submit a written request for final review to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final review and tests. On receipt of request, Architect will either proceed with review 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 reviews as incomplete is completed or corrected.
C. Re-Inspection Fees:

1. If the Architect performs re-inspections due to failure of the work to comply with the claims of status of completion made by the Contractor, or, should the Contractor fail to complete the work, or, should the Contractor fail to promptly correct warranty items or work later found to be deficient:
   a. Owner will compensate Architect for such additional services.
   b. Owner will deduct the amount of such compensation from the final payment to the Contractor.

2. If the Work is not completed by the date set in the agreement, and the Architect needs to perform additional Contract Administrative and on site observation duties:
   a. Owner will compensate Architect for such additional services.
   b. Owner will deduct the amount of such compensation from the final payment to the Contractor.

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.

1. Unless indicated otherwise, all warranties shall commence on the date of Substantial Completion.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

D. Warranties in Paper Form:

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper. Submit final warranties as a package for the entire project, assembled and identified as described below.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
E. Provide additional copies of each warranty to include in operation and maintenance manuals.

F. Warranty Response Time: The Contract shall respond and begin to take necessary action within 7 days of receipt of written notification from the Owner. Response time for life safety items, and for building perimeter security shall be within 24 hours of receipt of written notification from the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before 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. Remove snow and ice to provide safe access to building.

   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

   h. Sweep concrete floors broom clean in unoccupied spaces.

   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
j. Resilient flooring shall be scrubbed and cleaned with cleaner recommended by the flooring manufacturer just prior to occupation by Owner. No-wax floors shall cleaned and buffed in accordance with flooring manufacturer’s requirements.

k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces. Cleaning of windows shall be done just before Owner occupancy.

l. Remove labels that are not permanent.

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

n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.


q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.

r. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "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 replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.

2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:

1. Section 013300 "Submital Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following formats:

1. Submit by email to Architect. Enable reviewer comments on draft submittals.
2. Submit one paper copy.
C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf or post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components
of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.


5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor and primary subcontractors.
6. Name and contact information for Architect.
7. Name and contact information for Commissioning Authority.
8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals, List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Emergency operations and shutdown information that must be immediately available during emergency situations to protect life and property and to minimize disruptions to building occupants.

C. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

D. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
5. Power failure.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.
E. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

F. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify
each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.
1.10 PRODUCT MAINTENANCE MANUALS

A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.
5. Directories.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for general closeout procedures.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Submit all project record documents as one submittal package.

B. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.

C. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

D. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

E. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

F. Reports: Submit written report monthly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.
1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an acceptable drawing technique.
   c. Record data as soon as possible after obtaining it.
   d. Record and check the markup before enclosing concealed installations.
   e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:
1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

1.5 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer’s written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as annotated PDF electronic file.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

1.6 DIRECTORIES

A. Directories: Contractor/Subcontractor directory.

1. Submit one hard copy and one copy on USB storage device in PDF format.

B. Directory: Name, address and telephone number for General Contractor, all major subcontractors, organized by specification section. Provide a separate list in alphabetical order.
1.7 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.

   1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.
1.4 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

1.5 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

1. Motorized doors, including overhead coiling doors and automatic entrance doors.
2. Equipment, including food-service equipment.
3. Fire-protection systems, including fire alarm fire pumps and fire-extinguishing systems.
4. Intrusion detection systems.
5. Conveying systems, including elevators.
6. Heat generation, including boilers pumps and water distribution piping.
7. Refrigeration systems, including condensers pumps and distribution piping.
8. HVAC systems, including air-handling equipment air distribution systems and terminal equipment and devices.
9. HVAC instrumentation and controls.
10. Electrical service and distribution, including transformers switchboards panelboards uninterruptible power supplies and motor controls.
11. Packaged engine generators, including transfer switches.
12. Lighting equipment and controls.
13. Communication systems, including intercommunication clocks and programming voice and data and television equipment.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.
2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Systems and equipment operation manuals.
   c. Systems and equipment maintenance manuals.
   d. Product maintenance manuals.
   e. Project Record Documents.
   f. Identification systems.
   g. Warranties and bonds.
   h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

1.6 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.7 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

   1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
   2. Owner will furnish an instructor to describe Owner's operational philosophy.
   3. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

   1. Schedule training with Owner, through Architect, with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, a written or a demonstration performance-based test.

E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.
1.8 DEMONSTRATION AND TRAINING SCHEDULE

A. Demonstration of equipment includes, but is not limited to, the following:

1. Overhead coiling doors.
2. Overhead coiling grilles.
3. Operable partitions.
4. Stage curtains.
5. Gymnasium equipment and dividers.
6. Telescoping stands.

B. Demonstration and training of equipment includes, but is not limited to, the following:

1. Foodservice equipment.

C. Demonstration and training with video recording of equipment includes, but is not limited to, the following:

1. HVAC equipment and systems.
2. Electrical equipment and systems.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION
PAR 1 - GENERAL

1.01 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
   1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests executed by Contractor and witnessed by Sparhawk Group are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
   4. Verify that the Owner’s operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion

C. Sparhawk Group directs and coordinates all commissioning activities; this section describes some but not all of Sparhawk Group's responsibilities.

D. Sparhawk Group is employed by Owner.

1.02 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Plumbing Systems:
   1. Domestic Hot Water Systems
   2. Pumps
   3. Controls

C. Building Envelope
   1. Review contractor submittals
   2. Verify inclusion of operator and occupant training requirements in construction documents.
   3. Storefront, Curtain Wall, Insulated Translucent Wall Panels, and Window testing requirements are provided in the individual specification sections for these products.

D. HVAC System, including:
   1. Major and minor equipment items.
   2. Piping systems and equipment.
   3. Control system.
   4. Variable frequency drives.

E. Electrical Systems:
   1. Service and distribution.
   2. Lighting controls other than manual switches.
   3. Generator/ATS
1.03 RELATED SECTIONS
A. None

1.04 REFERENCES
A. PECI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests; Portland Energy Conservation, Inc.; located at http://www.peci.org/library/mcpgs.htm; current edition or approved alternate forms generated and provided by Sparhawk Group.

1.05 SUBMITTALS
A. See Section 013300 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, to the designer of record, copying Sparhawk Group
   2. Submit one copy to Sparhawk Group, not to be returned.
   3. Make commissioning submittals on time schedule specified by Sparhawk Group.
   4. Submittals indicated as "Draft" are intended for the use of Sparhawk Group in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word preferred.
   5. As soon as possible after submittals made to designer of record are approved, submit copy of approved submittal to Sparhawk Group.
B. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.
C. Product Data: If submittals to Designer of record do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.
   6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.
D. Startup Plans and Reports.
E. Completed Prefunctional Checklists.

PART 2 - PRODUCTS

2.01 TEST EQUIPMENT
A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
   1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
   2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
3. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are not to become the property of Owner.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required for Functional Tests will be provided by Sparhawk Group and will not become the property of Owner.

PART 3 - EXECUTION

3.01 COMMISSIONING PLAN

A. Sparhawk Group will prepare the Commissioning Plan.
   1. Attend meetings called by Sparhawk Group for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Sparhawk Group within 60 days after award of Contract.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Sparhawk Group for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 DOCUMENTATION IDENTIFICATION SYSTEM

A. Give each submitted form or report a unique identification; use the following scheme.

B. Type of Document: Use the following prefixes:
   1. Startup Plan: SP-.
   2. Startup Report: SR-.
   3. Prefunctional Checklist: PC-.
   4. Functional Test Procedure: FTP-.
   5. Functional Test Report: FTR-.

C. System Type: Use the first 4 digits from CSI/CSC MasterFormat, 2004 Edition, that are applicable to the system; for example:
   1. 2300: HVAC system as a whole.
   2. 2320: HVAC Piping and Pumps.
   3. 2330: HVAC Air Distribution.
D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.

E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.

F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

3.03 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to Sparhawk Group.

3.04 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed except for room control (IE thermostats and or zone controls) whereas, a representative sampling will be commissioned.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractors are responsible for filling out Prefunctional Checklists, after completion of installation and before startup.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for correction provided by the Contractor. Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
4. If any Checklist line item is not relevant, record reasons on the form.
5. Contractor may independently perform startup inspections and/or tests, at his option.
6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
7. Submit completed Checklists to Sparhawk Group within two days of completion.

C. Sparhawk Group is responsible for furnishing the Prefunctional Checklists.
   1. Provide all additional information to aid in preparation for functional testing. Such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
   2. Sparhawk Group may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in the Contract Documents or not.
   3. When asked to review the proposed Checklists, do so in a timely manner.

D. Sparhawk Group Witnessing: Required for:
   1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
   2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
   1. If difficulty in correction would delay progress, report deficiency to Sparhawk Group immediately.

3.05 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Sparhawk Group is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, Sparhawk Group will document the deficiency and the Contractor's stated intentions regarding correction.
   1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents or does not perform properly.
   2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to Sparhawk Group; Sparhawk Group will reschedule the test and the Contractor shall re-test.
   3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
   4. Contractor shall bear the cost of Owner and Sparhawk Group personnel time witnessing re-testing.

E. Functional Test Procedures:
   1. Some test procedures are included in the Contract Documents; where Functional Test procedures are not included in the Contract Documents, test procedures will be determined
by Sparhawk Group with input by and coordination with Contractor.

2. Examples of Functional Testing:
   a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
   b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
   c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
   d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to Sparhawk Group is Functional Testing.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.06 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gages, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
   1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
   2. Verify that sensors with shielded cable are grounded only at one end.
   3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
   4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:
   1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   2. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
   3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
   1. Disconnect sensor.
   2. Connect a signal generator in place of sensor.
   3. Connect ammeter in series between transmitter and building automation system control panel.
   4. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature.
   5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
   6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or
maximum and verify at the building automation system.
7. Record all values and recalibrate controller as necessary to conform with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gage or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.
3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.

3.07 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
   a. Major equipment.
   b. Life-safety-critical equipment.
   c. Prejunctural Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample;
   defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested;
   defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than
   three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining
   identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, Sparhawk Group
   may stop the testing and require Contractor to perform and document a checkout of the
   remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct
observation to verify performance (contrasted to analyzing monitored data taken over time to
make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the
response of a system.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage,
resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control
system to see the response of the system; for example, change the outside air temperature value
from 75 degrees F to 50 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a
control system screen reporting a damper to be 100 percent closed, are considered indirect
indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation
using dataloggers or the trending capabilities of the relevant control systems; where monitoring
of specific points is called for in Functional Test Procedures:
1. All points that are monitored by the relevant control system shall be trended by Contractor;
at Sparhawk Group’s request, Contractor shall trend up to 20 percent more points than
specified at no extra charge.
2. Other points will be monitored by Sparhawk Group using dataloggers.
3. At the option of Sparhawk Group, some control system monitoring may be replaced with
datalogger monitoring.
4. Provide hard copies of monitored data in columnar format with time down left column and
   at least 5 columns of point values on same page.
5. Graphical output is desirable and is required for all output if the system can produce it.
6. Monitoring may be used to augment manual testing.

END OF SECTION 018110
SECTION 02 41 00

DEMOLITION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included:

1. Demolition and removal of selected portions of buildings and structures and as required for new work. Refer to the Drawings for additional requirements.
2. Demolition and removal of selected site elements and as required for new work. Refer to the Drawings for additional requirements.
3. Salvage of existing items to be reused or turned over to the facility.
4. Removal and legal disposal of demolished materials off site. Except those items specifically designated to be relocated, reused, or turned over to the facility, all existing removed materials, items, trash and debris shall become property of the Contractor and shall be completely removed from the site and legally disposed of at their expense. Salvage value belongs to the Contractor. On-site sale of materials is not permitted.
5. Demolition and removal work shall properly prepare for alteration work and new construction to be provided under the Contract.
6. Scheduling and sequencing operations without interruption to utilities serving occupied areas. If interruption is required, obtain written permission from the utility company and the Owner.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 011000 - GENERAL REQUIREMENTS for temporary facilities and controls, for maintenance of access, for cleaning during construction, and for dust and noise control.
2. Section 017400 - CONSTRUCTION WASTE MANAGEMENT for waste management and recycling.
3. Division 21 - FIRE PROTECTION:
   a. Disconnecting, capping and otherwise making inactive existing fire protection services in areas where demolition and removal work is required.
   b. Disconnect and reinstallation of fire protection equipment temporarily interrupted during construction.
4. Division 22 - PLUMBING:
   a. Disconnecting, capping and otherwise making inactive existing plumbing services in areas where demolition and removal work is required.
   b. Disconnection and reinstallation of plumbing equipment temporarily interrupted during construction.
5. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING:
   a. Disconnecting, capping and otherwise making inactive existing HVAC services in areas where demolition and removal work is required.
   b. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.

6. Division 26 - ELECTRICAL WORK:
   a. Disconnecting, capping and otherwise making inactive existing electrical services in areas where demolition and removal work is required.
   b. Disconnect and reinstallation of electrical equipment temporarily interrupted during construction.
   c. Disconnect and remove all electrical items and equipment indicated on electrical drawings, unless otherwise noted. Remove all associated conduit, wiring, boxes, and junction/pull boxes back to source panelboard(s). Remove conduits that enter floor slab to a minimum 2” below slab and cap. Patch floor slab smooth to match surrounding surface.

1.3 DEFINITIONS
   A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
   B. Remove and Salvage: Detach items from existing construction and deliver them to the Owner ready for reuse, at a location designated by the Owner. Protect from weather until accepted by Owner.
   C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated. Protect from weather until reinstallation.
   D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP
   A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain property of the Owner as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the Owner.

1.5 SUBMITTALS
   A. Schedule of Selective Demolition Activities: Indicate the following:
      1. Detailed sequence of selective demolition and removal work, with early and late starting and finishing dates for each activity. Ensure Owner's on-site operations are uninterrupted if applicable.
      2. Interruption of utility services. Indicate how long utility services will be interrupted.
      3. Coordination for shutoff, capping, and continuation of utility services.
      4. Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other occupants affected by selective demolition operations.
      5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
6. Means of protection for items to remain and items in path of waste removal from building.

B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged, and turned over the Owner.

C. Predemolition Video and Pictures: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 requirements. Submit before Work begins.

1.6 QUALITY ASSURANCE

A. Examination of Existing Conditions: The Contractor shall examine the Contract Drawings for demolition and removal requirements and provisions for new work. Verify all existing conditions and dimensions before commencing work. The Contractor shall visit the site and examine the existing conditions as he finds them and shall inform herself/himself of the character, extent and type of demolition and removal work to be performed. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time period established for receipt of such questions during the bidding period.

B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Section 011000 - GENERAL REQUIREMENTS, Project Meetings. Review methods and procedures related to selective demolition including, but not limited to, the following:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 SALVAGING

A. Salvaged for Reinstallation: Materials indicated on the Drawings to be salvaged and reinstalled shall be carefully removed and stored at a location acceptable to the Architect and Owner.
B. Salvaged for Storage: Materials indicated on the Drawings or designated in the field by the Owner to be salvaged and stored shall be carefully removed and delivered to the Owner at locations determined by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer registered in the state that the project is located to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction videotapes.

1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

G. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies and Owner.

2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

4. Prior to commencing cutting work in existing surfaces, take all precautionary measures to assure that mechanical and electrical services to the particular area have been made inactive. Coordinate with Fire Suppression, Plumbing, HVAC, and Electrical subcontractors. Only licensed tradesmen of that particular trade shall disconnect and cap existing mechanical and electrical items that are to be removed, abandoned and/or relocated.
5. If, during the process of cutting work, existing utility lines are encountered which are not indicated on the Drawings, regardless of their condition, immediately report such items to the Architect. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 011000 - GENERAL REQUIREMENTS, Temporary Facilities and Controls.
2. Maintain adequate passage to and from all exits at all times. Before any work is done which significantly alters access or egress patterns, consult with the Architect and obtain approval of code required egress. Under no condition block or interfere with the free flow of people at legally required exits, or in any way alter the required condition of such exits.

B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area(s).

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Provide temporary barricades as required to limit access to demolition areas.
2. Protect existing site improvements, appurtenances, and landscaping to remain.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. 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 fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Maintain clear unimpeded passage through the work area for safety and emergency egress.
10. Saw cut overruns in concrete and masonry for new door, window and other finish openings is not permitted. Core drill corners and finish square to match required opening.

11. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to storage area designated by the Owner.
   5. Protect items from damage during transport and storage.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 PROTECTION OF PUBLIC AND PROPERTY

A. Provide all measures required by federal, state and municipal laws, regulations, and ordinances for the protection of surrounding property, the public, workmen, and Owner’s employees during all demolition and removal operations. Measures are to be taken, but not limited to installation of sidewalks, sheds, barricades, fences, warning lights and signs, trash chutes and temporary lighting.

B. Protect all walks, roads, streets, curbs, pavements, trees and plantings, on and off premises, and bear all costs for correcting such damage as directed by the Architect, and to the satisfaction of the Owner.

C. Demolition shall be performed in such a manner that will insure the safety of adjacent property. Protect adjacent property from damage and protect persons occupying adjacent property from injuries which might occur from falling debris or other cause and so as not to cause interference with the use of other portions of the building, of adjacent buildings or the free access and safe passage to and from the same.

D. Every precaution shall be taken to protect against movement or settlement of the building, of adjacent buildings, sidewalks, roads, streets, curbs and pavements. Provide and place at the Contractor’s own expense, all necessary bracing and shoring in connection with demolition and removal work.

E. Remove portions of structures with care by using tools and methods that will not transfer heavy shocks to existing and adjacent building structures, both internal and external of the particular work area.

F. Provide and maintain in proper condition, suitable fire resistive dust barriers around areas where interior demolition and removal work is in progress. Dust barriers shall prevent the dust migration to adjacent areas. Remove dust barriers upon completion of major demolition and removal in the particular work area.

3.6 DISCOVERY OF HAZARDOUS MATERIALS

A. If hazardous materials, such as chemicals, asbestos-containing materials, or other hazardous materials are discovered during the course of the work, cease work in affected area only and
immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.

B. If unmarked containers are discovered during the course of the work, cease work in the affected area only and immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Take immediate precautions to prohibit endangering the containers integrity. Continue work in other areas.

3.7 CUTTING

A. Perform all cutting of existing surfaces in a manner which will ensure a minimal difference between the cut area and new materials when patched. Use extreme care when cutting existing surfaces containing concealed utility lines which are indicated to remain and bear full responsibility for repairing or replacement of all such utilities that are accidentally damaged.

B. Provide a flush saw cut edge where pavement, curb and concrete removals abut new construction work or existing surfaces to remain undisturbed.

C. All slurry and water shall be contained and managed to avoid damage to existing conditions when using a wet saw or wet core driller.

D. Obtain and pay for a hot work permit and arrange to have on-site a Fire Watch when using a cutting torch or similar item.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Comply with requirements of Section 017400 - CONSTRUCTION WASTE MANAGEMENT and the following:

   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.

3.9 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Premises shall be left in a clean condition and ready to accept alteration work and new construction.

3.10 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:


1.3 PERFORMANCE REQUIREMENTS

A. Wet Dynamic Coefficient of Friction: For flooring exposed as a walking surface, provide products with the following values as determined by testing identical products per ANSI/ NFSI B101.3 - 2012 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials, or ANSI 326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Materials - 2017. Testing by other methods or earlier editions of the specified test method is not acceptable.

1. Wet Dynamic Coefficient of Friction: Not less than 0.43.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for concrete floor toppings.

D. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

B. Mockups: Place concrete floor topping mockups to demonstrate typical joints, surface finish, bonding, texture, tolerances, and standard of workmanship.

1. Build mockups approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.

2. If Architect determines that mockups do not meet requirements, demolish and remove them from the site and cast others until mockups are approved.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage, mixing with other components, and application.

B. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting concrete floor topping performance.

1. Place concrete floor topping only when ambient temperature and temperature of base slabs are between 50 and 86 deg F.

B. Close areas to traffic during topping application and, after application, for time period recommended in writing by manufacturer.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED TOPPING

A. Topping: Hydraulic-cement-based, polymer-modified, self-leveling product complying with ASTM C 387, that can be applied in minimum uniform thicknesses of 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Ardex; K-15 Self-Leveling Concrete Topping.
   b. BASF Building Systems; Thoro Underlayment, Self-Leveling.
   c. KOSTER LevelStrong High Strength.
   d. KOSTER LevelStrong SLU.
   e. USG; Durock Speed Floor Underlayment.
   f. USG; Durock Ultra Cap Floor Underlayment.

2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.

3. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.

4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.
1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.

E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.

F. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.

1. Coating shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance of concrete floor topping.

B. Verify that base concrete slabs comply with scratch finish requirements specified in Section 033000 - CAST-IN-PLACE CONCRETE.

C. Verify that base slabs are visibly dry and free of moisture. Test for capillary moisture by the plastic sheet method according to ASTM D 4263.

D. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

A. At the start of the installation and periodically as work progresses, provide the services of the manufacturer's technical representative at the job site as often as deemed necessary by the manufacturer to advise on all phases of this Work.

B. Install the system in accordance with manufacturer's published instructions, except where more stringent requirements are specified.

3.3 PREPARATION

A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch.

1. Prepare and clean existing base slabs according to concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
2. Mechanically remove contaminants from existing concrete that might impair bond of floor topping.
3. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler.

B. Fill non-moving cracks and joints as recommended by the concrete underlayment materials manufacturer.

C. Concrete Underlayment Over Concrete Slab: Prime porous surfaces of 11% (minimum) absorption with primer. Comply with underlayment concrete manufacturer's recommendations.

3.4 INSTALLATION

A. Mix materials by methods and in proportions recommended by manufacturer. 

B. Maximum depth of concrete underlayment shall be 2 in. Minimum depth shall be 1/4 in. Add aggregates as recommended by manufacturer for underlayment depth over 1 in.

C. Install control joints following manufacturer's recommendations in locations indicated on the Drawings.

D. Allow underlayment to cure properly. Block off traffic and protect floor underlayment from physical damage during curing.

E. Test for dryness by taping 24 x 24 in. sections of plastic to concrete underlayment surface. After approximately 16 hours of curing, if no condensation occurs, the installation shall be considered dry and ready to receive finish flooring.

3.5 PROTECTING AND CURING

A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.

B. Evaporation Retarder: Apply evaporation retarder to concrete floor topping surfaces in hot, dry, or windy conditions before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying floor topping, but before float finishing.

C. Begin curing immediately after finishing concrete floor topping. Cure by according to concrete floor topping manufacturer's written instructions:

3.6 JOINT FILLING

A. Prepare and clean contraction joints and install semirigid joint filler, according to manufacturer's written instructions, once topping has fully cured.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.7 REPAIRS

A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.
3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of completed applications of concrete floor toppings shall take place in successive stages, in areas of extent and using methods as follows:

1. Sample Sets: At point of placement, a set of 3 molded-cube samples shall be taken from the topping mix for the first 1000 sq. ft., plus 1 set of samples for each subsequent 5000 sq. ft. of topping, or fraction thereof, but not less than 6 samples for each day's placement. Samples shall be tested according to ASTM C 109 for compliance with compressive-strength requirements.

2. Concrete floor topping shall be tested for delamination by dragging a steel chain over the surface.

3. Concrete floor topping shall be tested for compliance with surface flatness and levelness tolerances.

C. Remove and replace applications of concrete floor topping where test results indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Exterior non-load-bearing wall framing.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061600 - SHEATHING for exterior sheathing applied to cold-formed metal framing.
2. Section 092110 - GYPSUM BOARD ASSEMBLIES for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

2. Deflection Limits: Design framing systems to withstand design loads within deflections greater than the following:

   a. Exterior Non-Load-Bearing Framing:

      1) Horizontal deflection of l/240 of the wall height for metal panel systems.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load, plus superimposed dead load, deflection of primary building structure.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

1.4 SUBMITTALS

A. Product Data: For each type of cold-formed metal framing product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. Shop drawings shall be signed and sealed by a professional engineer currently licensed in the Commonwealth of Massachusetts.

C. Welding certificates.

D. Qualification Data: For professional engineer.

E. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Miscellaneous structural clips and accessories.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional structural engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.


E. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Truss Design."
2. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

2. ClarkDietrich Building Systems.
3. EB Metal U.S.
4. MarinoWARE.

2.2 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90 (Z275).

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Match existing.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs.
C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. MarinoWARE, a division of Ware Industries.
   c. The Steel Network, Inc.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated.

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, threaded carbon-steel bolts, and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.


D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

   1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS


   1. Provide interior, field-applied primer with a VOC content of 250 g/L or less.

1. Basis of Design: Sika; SikaGrout 212.
2. VOC Content: 0 g/L.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sill Sealer Gaskets: Closed-cell foam, 1/4 inch thick, selected from manufacturer’s standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install sill sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing according to AISI's “Standard for Cold-Formed Steel Framing - General Provisions” and to manufacturer’s written instructions unless more stringent requirements are indicated.

C. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer’s standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
   1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.
3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Wood blocking, cants, and nailers.
2. Plywood backing panels.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061600 - SHEATHING for plywood.
2. Section 064020 - INTERIOR ARCHITECTURAL WOODWORK for interior woodwork not specified in this Section.
3. Section 092110 - GYPSUM BOARD ASSEMBLIES for sheet metal backing.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Indicate component materials and dimensions and include construction and application details.
2. 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, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
3. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that
periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. 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 lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
   1. Factory mark each piece of lumber 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 lumber.
   3. Provide dressed lumber, S4S, unless otherwise indicated.
   4. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

B. Plywood Panels:
   1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
   2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
   3. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
      a. Use Borate or Copper Azule treatments. Product shall not contain creosote, arsenic or pentachlorophenol.
   2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 18 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete in exterior walls.

E. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Hoover Treated Wood Products; PyroGuard.
2. Koppers Performance Chemicals; LifeWood MicroPro Treatment.
3. Sustainable Northwest Wood; Pressure Treated Wood with Copper Azule.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: For fire-rated exterior walls, all interior use materials, and where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Treatment shall not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.
5. Product shall not contain creosote, arsenic or pentachlorophenol.

C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

2.4 MISCELLANEOUS LUMBER

A. General: Provide FRTW lumber for support or attachment of other construction, including, but not limited to, the following: Rooftop equipment bases and support curbs, blocking, cants, nailers, furring and grounds.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.
2.5 PANEL PRODUCTS

A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.

B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.


C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5; except provide stainless steel complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2, where in contact with pressure-preservative treated wood or when exposed to exterior conditions.

2.7 MISCELLANEOUS MATERIALS

A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   b. Henkel Corp.; OSI SF450 Heavy Duty Subfloor Construction Adhesive.

2. Low-Emitting Materials: Provide adhesives in compliance with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation
of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

3. VOC Content: 70 g/L or less.
4. Do not use adhesives that contain urea formaldehyde.
5. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach carpentry work as indicated and according to applicable codes and the following:
   2. ICC-ES evaluation report for fastener.

E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install as 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.

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

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Wall sheathing.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood framing and miscellaneous plywood backing panels.
2. Section 076200 - SHEET METAL FLASHING AND TRIM for flashing applied to sheathing.

1.3 SUBMITTALS

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

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.
1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

B. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.


1.5 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. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

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

C. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior and Interior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings.

2.4 PLYWOOD SHEATHING


1. Span Rating: As indicated on Structural Drawings.
2. Nominal Thickness: Not less than 1/2 inch
3. Edges: Square.

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 wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.
2. For pressure-preservative treated sheathing, provide fasteners of Type 304 stainless steel only.

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. Wood Screws: ASTM C 1002.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or Type 304 stainless steel.
2. For pressure-preservative treated sheathing, provide fasteners of Type 304 stainless steel only.
2.6 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

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, as applicable:

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 sheathing installation with air/vapor retarders, flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

3.2 WOOD STRUCTURAL PANEL INSTALLATION


B. Fastening Methods: Fasten panels as indicated below:

1. Wall Sheathing:

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

END OF SECTION
SECTION 06 20 10
EXTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Exterior wood siding and trim.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 054000 - COLD-FORMED METAL FRAMING for secondary support framing supporting siding.
2. Section 061600 - SHEATHING for sheathing substrate for air barrier system.
3. Section 072100 - THERMAL INSULATION for insulation in studs.
4. Section 072700 - AIR BARRIERS for fluid-applied air barriers and membrane flashings.
5. Section 076200 - SHEET METAL FLASHING AND TRIM for metal flashings.
6. Section 079200 - JOINT SEALANTS for field-applied sealants not otherwise specified in this Section.
7. Section 099000 - PAINTING AND COATING for field-finishing work of this Section.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Indicate location and nailing pattern for exposed surface nailing, as required by project conditions.

C. Samples for Verification: For each type, color, texture, and pattern required.

1. 12-inch-long-by-actual-width Sample of siding, soffits and trim.
2. For cellular PVC trim, with half of exposed surface finished; 50 sq. in.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Mock-Up: Mock-up of exterior wall including wood siding is required. Comply with requirements of Section 014330 - MOCKUPS.
C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Meet with the Owner Project Manager; Architect, Owner insurer if applicable; testing and inspecting agency representative; siding Installer; siding manufacturer’s senior representative; sheathing and air barrier Installer; and installers whose work interfaces with or affects siding, including installers of windows and doors.
2. Review methods and procedures related to siding installation, including manufacturer’s written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine substrate conditions for compliance with requirements, including flatness and fastening.
5. Review flashings, special siding details, siding penetrations, trim installation, and finishes.
6. Review temporary protection requirements for siding during and after installation.
7. Review siding observation and repair procedures after siding installation.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials in a dry, well-ventilated, weathertight place.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

1.7 SEQUENCING

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

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering.

1. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than Hunter color-difference units as measured according to ASTM D 2244.
2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

B. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

2.2 ACCESSORIES

A. Blocking, Shims, and Nailers: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Flashing: Provide metal flashing complying with Section 076200 - SHEET METAL FLASHING AND TRIM at window and door heads and where indicated.

C. Screws: Select material, type, size, and finish required for each use, nonferrous metal or hot-dip galvanized, unless otherwise indicated. Comply with ASME B18.6.1 for applicable requirements.

1. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch or 3 screw-threads into substrate.

2.3 FABRICATION

A. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

D. Shop-cut openings, to maximum extent possible, to receive hardware, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and seal edges with the linseed-based wood stain selected for the exposed face.

2.4 EXTERIOR TONGUE AND GROOVE SIDING AND SOFFITS

A. Provide Red Cedar siding, Clear Grade, absolutely no knots, Plain Sawn:

1. Exposure: As indicated.
2. Sizes and Shapes: Custom milled as indicated on the Drawings.

2.5 TRIM

A. Provide Boral TruExterior trim.

1. Sizes: As indicated on the Drawings.
2.6 SHOP PAINT

A. Linseed Based Wood Stains: Provide products of one of the following manufacturers that meet or exceed specified requirements:
   1. Samuel Cabot, Inc. (Cabot) "Clear Solutions," "Bleaching Oil 6241"
   2. Olympic Stain. (Olympic) "Weathering Stain" 350 g/l VOC max.

B. Application: Provide one coat of stain on all sides of each piece, at spreading rate recommended by stain manufacturer for exterior wood siding, soffits, and trim. Color shall match Architect’s sample.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding 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. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
   1. Do not install damaged components.
   2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
   3. Cut edges shall be sealed with wood stain selected for the exposed face finish.

B. Dress and sand finish carpentry work free from machine and tool marks, mill glaze, abrasions, raised grain, or other defects on surfaces exposed to view.

C. Provide tight joints formed to conceal shrinkage. Fit butt joints with concealed spline. Glue and dowel shop miters which are four inches or greater. Glue and spline miters less than 4 in., with spline concealed.

D. Blind nail work to the greatest extent possible. Where surface nailing is required by project conditions, set and fill nails to match adjacent wood. Surface nailing shall be done with nails equally spaced, vertically and horizontally aligned.
   1. Provide concealed nailing as specified. Nail shall be in tongue of siding in a position where it will not be visible in the reveal when the next board is installed.
   2. Where exposed surface nailing is required by project conditions, Architect shall approve location and nailing pattern.

E. Install joint sealants as specified in Section 079200 - 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
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior standing and running trim.
2. Wood casework and surrounds.
3. Linear wood ceiling.
5. Plastic-laminate countertops.
6. Solid-surfacing-material countertops.
7. Closet and utility shelving.
8. Installation of existing Owner cubicles.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.

C. Alternates: Refer to Drawings and Section 012300 - ALTERNATES for requirements.

1.3 SUBMITTALS

A. Product Data: For each type of product specified, including casework hardware and accessories, and finishing materials and processes.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.

   a. Provide schedule of blocking required to support the Work of this Section.
2. Show locations and sizes of cutouts and holes for plumbing fixtures, electrical components and other items installed in architectural woodwork.
3. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.

C. Samples for Verification:

1. Lumber with or for transparent finish, not less than 5 inches wide by 12 inches long for each species and cut, finished on 1 side and 1 edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
   a. Submit step-type range sample sets of factory finished plywood and factory finished solid wood in size illustrating wood grain and specified finish, including edge banding detail and any veneer or solid edge glue joints.
   b. Submit one leaf for every 1000 gross square foot of veneer required.
3. Plastic laminates, 8 by 10 inches for each type, color, pattern, and surface finish, with 1 sample applied to core material, and specified edge material applied to 1 edge.
4. Solid-surfacing materials, 6 inches square.

D. Woodwork Quality Standard Compliance Certificates: Submit registration number for AWI Quality Certification Program.

E. Qualification Data: For Installer and fabricator.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Certified participant in AWI's Quality Certification Program.

C. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with blueprint-matched wood veneers and components.

   1. Provide AWI Quality Certification Program labels and certificates indicating that woodwork, including installation, complies with requirements of grades specified. Upon notice of award, register the work under this section with the AWI Quality Certification Program.

E. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

   1. The HVAC systems as specified elsewhere may not provide for humidity controls. The expected ranges of relative humidity are expected to be as high as 55% to a low of uncontrolled during the heating system. Comply with AWS Section 2, Care and Storage.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

   1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

   2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
PART 2 - PRODUCTS

2.1 BASIS-OF-DESIGN

A. Basis-of-Design Products: Refer to the Interior Materials Legend on the Drawings.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of AWI/AWMAC/WI's "Architectural Woodwork Standards" for each type of woodwork and quality grade specified, unless otherwise indicated.

B. Wood Veneers and Lumber: Provide AWI Custom Grade materials and workmanship, unless otherwise indicated. For species not listed in the AWS comply with the following:

1. Provide AWI Lumber Grade 1 and AWI Grade A Veneer, book-matched, minimum 6 inch face veneer width. Kiln dry to 6-8 percent moisture content. Components shall be free of defects and sapwood. Match adjacent pieces for color and grain pattern.

2. Single-Source Requirement for Wood Veneers and Solids: Intent is to provide wood which matches as closely as possible throughout the project. Provide wood veneers and solids from the same distributor, and from the same flitches and solids sources to the greatest extent possible.

C. Wood Species and Cut for Transparent Finish: As selected by the Architect.

1. Architect’s control samples for transparent finish, veneer grain and figure characteristics are available for review at the office of the Architect.

2. Veneer Matching Requirements:
   a. Matching Between Adjacent Veneer Leaves: Book match and architectural end match.

D. Composite Wood Products: Comply with the following:

1. Composite Wood, General: CARB II compliant or made with binder containing no added formaldehyde (NAF).

2. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade MD.


   a. Resin impregnated paper backs are not permitted. Backs shall be of compatible hardwood species and cut. Contact adhesive is not permitted.

E. High-Pressure Decorative Plastic Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:

   a. Abet Laminati, Inc.
   b. Arborite; a division of Wilsonart.
c. Formica Corporation.
d. Lab Designs.
e. Lamin-Art; a division of Wilsonart.
f. Nevamar, Panolam, and Pionite; divisions of Panolam Surface Systems.
g. Wilsonart LLC.

F. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISFA-2.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Avonite Surfaces; Aristech Surfaces.
   b. E. I. du Pont de Nemours and Company; Corian.
   c. Formica Corporation.
   d. LG Hausys; Hi-Macs.
   e. Wilsonart LLC.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.

1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:

2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
3. Kiln-dry materials before and after treatment to levels required for untreated materials.

C. Fire-Retardant Particleboard: Panels complying with the following requirements, made from softwood particles and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 25 or less per ASTM E 84.

1. Fire-Retardant Fiberboard and Particleboard: Provide five ply construction with crossbands to prevent any ammonia fuming from the core to the face veneers.
2.4 CASEWORK HARDWARE AND ACCESSORIES

A. General: Provide casework hardware and accessory materials associated with architectural casework, except for items specified in Section 087100 - DOOR HARDWARE.

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602,100 degrees of opening, self-closing.

C. Back-Mounted Pulls: BHMA A156.9, B02011.

D. Catches: Push-in magnetic catches, BHMA A156.9, B03131.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04071; with shelf rests, B04081 or BHMA A156.9, B04102; with shelf brackets, B04112.

F. Drawer Slides: BHMA A156.9, B05091; side mounted and extending under bottom edge of drawer; full-extension type; epoxy-coated-steel with steel ball-bearings; of the following grades:

1. Box Drawer Slides: Grade 1.
2. File Drawer Slides: Grade 1HD-100.
3. Pencil Drawer Slides: Grade 2.
5. Trash Bin Slides: Grade 1HD-100.

G. Aluminum Slides for Sliding Doors: BHMA A156.9, B07063.

H. Door Locks: BHMA A156.11, E07121.

I. Drawer Locks: BHMA A156.11, E07041.

J. Grommets for Cable Passage through Countertops: Molded-plastic grommets and matching plastic caps with slot for wire passage.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.5 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Installation Adhesives and Wood Glues: Formulations approved for use indicated by adhesive manufacturer.
1. **Low-Emitting Materials:** Provide adhesives in compliance with the requirements of the California Department of Public Health’s "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2. **VOC Limits:** Use installation adhesives that comply with the following limits for VOC content:
   
a. **Wood Glues:** 30 g/L.
   
b. **Contact Adhesives:** Not permitted on the Project without Architect's prior approval.

3. Do not use adhesives that contain urea formaldehyde.

4. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

### 2.6 FABRICATION, GENERAL

**A.** Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

**B.** Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

**C.** Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. **Corners of Casework and Edges of Solid-Wood (Lumber) Members and Rails:** 1/16 inch.

**D.** Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

**E.** Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

**F.** Install glass to comply with applicable requirements in Section 088000 - GLAZING and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

### 2.7 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

**A.** Grade: Custom.

**B.** Wood Species and Cut: Maple.

1. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.

**C.** For trim items wider than available lumber, use veneered construction. Do not glue for width.

**D.** For rails wider or thicker than available lumber, use veneered construction. Do not glue for width or thickness.
E. Assemble casings in plant except where limitations of access to place of installation require field assembly.

2.8 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. Wood Species and Cut: As specified hereinabove

C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.

D. Fire-Rated Interior Frames and Jambs Where Indicated: Products fabricated from fire-retardant particleboard or fire-retardant medium-density fiberboard with veneered, exposed surfaces and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Fire Rating: 20 minutes.

2.9 WOOD CASEWORK AND SURROUNDS FOR TRANSPARENT FINISH

A. Grade: Custom.

B. AWI Type of Casework Construction: Flush overlay.

C. Wood Species and Cut for Exposed Surfaces: As specified hereinabove.

1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
5. Veneer Matching within Room: Provide casework veneers in each room or other space from a single fitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

D. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
2. Drawer Sides and Backs: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
3. Drawer Bottoms: Hardwood plywood.

2.10 PLASTIC-LAMINATE CASEWORK

A. Grade: Custom.

B. AWI Type of Casework Construction: Flush overlay.

C. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: Grade HGS.

D. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
   a. Edges of Plastic-Laminate Shelves: PVC tape, 3 mm minimum thickness, matching laminate in color, pattern, and finish.
   b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS.

2. Drawer Sides and Backs: Solid-hardwood lumber.

3. Drawer Bottoms: Hardwood plywood.

E. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

F. Available manufacturers:
   1. Canplast.
   2. Charter Industries.

G. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from laminate manufacturer's full range.

2.11 LINEAR WOOD CEILINGS

A. Species and Cut: As indicated on Drawings.

B. Colors, Patterns, and Finishes: As indicated on Drawings.

2.12 PLASTIC-LAMINATE COUNTERTOPS (CT-1)

A. Grade: Custom.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
   1. As selected by Architect from manufacturer's full range.

D. Edge Treatment: As indicated.

E. Core Material: Exterior-grade plywood.

F. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

2.13 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Grade: Custom.
B. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:

1. As selected by Architect from manufacturer's full range.

C. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

1. Fabricate tops with shop-applied edges of materials and configuration indicated.
2. Fabricate tops with loose backsplashes for field application.

D. Drill holes in countertops for plumbing fittings and soap dispensers in shop.

2.14 CLOSET AND UTILITY SHELVING

A. Grade: Custom.

B. Shelf Material: 1-inch plastic laminate-faced panel product with solid-lumber edge.

C. Cleats: 3/4-inch solid lumber.

D. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; powder-coat-finished steel.

E. Adjustable Shelf Brackets: BHMA A156.9, B04112; powder-coat-finished steel.

2.15 SHOP FINISHING

A. General: Comply with AWI/AWMAC/WI's "Architectural Woodwork Standards" for factory finishing.

1. Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels.

C. Shop Priming: Shop apply the prime coat including backpriming, if any, for opaque-finished items specified to be field finished. Refer to Section 099000 - PAINTING AND COATING for material and application requirements.

D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen with sheen measured on 60-degree gloss meter per ASTM D 523:

1. Grade: Same as item to be finished.
2. AWS Finish System 5: Conversion varnish.
3. Washcoat for Closed-Grain Woods: Apply washcoat sealer to woodwork made from closed-grain wood before staining and finishing.
4. Staining: Match approved sample for color.
5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer’s written instructions, including those for adhesives used to install woodwork.

F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

G. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

H. Casework: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install casework with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Maintain veneer sequence matching of casework with transparent finish.
I. Countertops: Anchor securely by screwing through corner blocks of base casework or other supports into underside of countertop.

1. Align adjacent countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Secure backsplashes to tops with concealed metal brackets at 16 inches and to walls with adhesive.
4. Calk space between backsplash and wall with sealant specified in Section 079200 - JOINT SEALANTS.

J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION
SECTION 06 64 00
FRP PANELING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS
   A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within
      DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of
      the Specifications.

1.2 DESCRIPTION OF WORK
   A. Work Included: Provide labor, materials and equipment necessary to complete the work of this
      Section, including but not limited to the following:
      1. Glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.
   B. Related Work: The following items are not included in this Section and are specified under the
      designated Sections:
      1. Section 061000 - ROUGH CARPENTRY for wood furring for installing plastic paneling.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard
      sizes.

1.4 QUALITY ASSURANCE
   A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.
   B. Surface-Burning Characteristics: As determined by testing identical products according to
      ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of
      applicable testing agency.
      1. Flame-Spread Index: 25 or less.
      2. Smoke-Developed Index: 450 or less.

1.5 PROJECT CONDITIONS
   A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed
      and weathertight and temporary HVAC system is operating and maintaining ambient
      temperature and humidity conditions at occupancy levels during the remainder of the
      construction period.
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:

1. Crane Composites.
2. Marlite.
3. Nudo Products, Inc.

2.2 PLASTIC SHEET PANELING

A. General: Gelcoat-finished, glass-fiber reinforced plastic (FRP) panels complying with ASTM D 5319.

1. Nominal Thickness: Not less than 0.075 inch.
2. Surface Finish: Smooth texture.
3. Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.


B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

C. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

D. Adhesive: As recommended by plastic paneling manufacturer for substrate indicated.

2. VOC Content: 50 g/L or less.
3. Do not use adhesives that contain urea formaldehyde.
4. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

E. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 - JOINT SEALANTS.

2. VOC Content, Architectural Sealants: 250 g/L or less.
3. Methylene chloride and perchloroethylene may not be intentionally added to sealants.
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. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels and so that trimmed panels at corners are not less than 12 inches wide.
   1. Mark plumb lines on substrate at panel joint locations for accurate installation.
   2. Locate trim accessories to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install trim accessories with adhesive.

D. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Modify existing roofing systems as required to accommodate new construction or equipment removal.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood nailers, curbs, and blocking.
2. Section 076200 - SHEET METAL FLASHING AND TRIM for metal roof penetration flashings, flashings, and counterflashings.
3. Section 079200 - JOINT SEALANTS for sealants.
4. Division 22 - PLUMBING for roof drains.
5. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for roof curbs for HVAC equipment.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

C. Roofing System Design: Roofing system shall be designed to withstand Code required loads and wind speeds.

D. Flashings: Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations in FMG 1-49 Loss Prevention Data Sheet for Perimeter Flashings; FMG 1-29 Loss Prevention Data Sheet for Above Deck Roof Components; NRCA Roofing and Waterproofing Manual (Fourth Edition) for Construction
Details and SMACNA Architectural Sheet Metal Manual (Fifth Edition) for Construction Details, as applicable.

E. Certification: Upon completion of work of this Section, submit certification by existing roof manufacturer acknowledging that all work performed is acceptable and that the entire roof remains under warranty.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Insulation attachment patterns.
4. Details of special conditions and connections to adjoining work.
5. Proposed temporary, watertight, tie-off details for each substrate type.

C. Samples: For the following products:

1. Membrane Roofing: 12 by 12 inch size, of each color, where exposed in finished work.
2. Sheet Metal Roofing: 12 inches long by actual pan width, including finished seam.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

E. Qualification Data: For Installer and manufacturer.

1. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.

F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.

B. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01. Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with the Architect, Owner, Owner’s insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Roofing Contractor's Warranty: The roofing subcontractor shall supply Owner with a minimum two-year workmanship warranty for each roof. In the event any work related to the roofing, flashing, or metalwork is found to be defective within two years of substantial completion, the roofing contractor shall remove and replace such at no additional cost to the Owner. A copy of the roofing signed warranty shall be sent to the roofing system's manufacturer.
   1. The duration of the Roofing Contractor's two-year warranty shall run concurrent with the roofing system's manufacturer's existing warranty.

B. Roofing Systems Manufacturer's Warranty: Maintain existing warranties. Coordinate with Owner.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide products recommended by manufacturers to be fully compatible with indicated substrates. Provide separation materials as required to eliminate contact between incompatible materials.

1. Furnish specific product acceptable to manufacturer of roofing membrane which will not compromise the roofing manufacturer's warranty.

B. REPLACEMENT PANELS

1. Provide Butler MR-24 panels at locations indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through roofing.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

D. Coordinate installing membrane roofing system components so underlayment, vapor retarder, insulation, and cover boards are not exposed to precipitation or left exposed at the end of the workday.

3.3 INSTALLATION

A. Comply with installation requirements as specified within applicable roofing specifications for this project. Where there are no other roofing specifications, comply with installation requirements hereinbelow.
3.4 UNDERLAYMENT INSTALLATION
   A. Install underlayment board in a single layer over area to roof deck substrate with mechanical fasteners.

3.5 VAPOR-RETARDER INSTALLATION
   A. Install laminated-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches respectively. Stagger joints from underlayment board layer below. Bond vapor retarder to underlayment board as follows:
      1. Apply adhesive at rate recommended by vapor-retarder manufacturer. Seal laps with adhesive.
   B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.6 INSULATION AND COVERBOARD INSTALLATION
   A. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
   B. Install tapered insulation under area of roofing to conform to slopes indicated.
   C. Install layers of insulation under area of roofing to achieve required thickness. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
   D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
   E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
      1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
   F. Adhesively Applied Insulation: Install each layer of insulation and secure to deck using adhesive specifically designed and sized for adhering specified board-type roof insulation to deck type.
      1. Adhere insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
      2. Adhere insulation to resist uplift pressure at corners, perimeter, and field of roof.
   G. Install cover board in a single layer over area to roof deck substrate as indicated. Stagger joints from insulation layer below.

3.7 ADHERED ROOFING MEMBRANE INSTALLATION
   A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions, details, SPRI's Directory of Roof Assemblies listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
   B. Unroll roofing membrane and allow to relax before installing.
C. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

D. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

F. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.

G. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

H. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.

I. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.8 SHEET METAL ROOFING INSTALLATION

A. Sheet Metal Roofing: Install according to manufacturer's written instructions, details, and recommendations in SMACNA's "Architectural Sheet Metal Manual".

3.9 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports. Manufacturer's Technical Representative:
Engage a qualified manufacturer’s technical representative to perform roof tests and inspections and to prepare test reports.

C. Final Roof Inspection: Engage roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.

1. Notify Architect and the Owner 48 hours in advance of date and time of inspection.

D. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and the Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS
   A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within
      DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of
      the Specifications.

1.2 DESCRIPTION OF WORK
   A. Work Included: Provide labor, materials and equipment necessary to complete the work of this
      Section, including but not limited to the following:
      1. Mineral-wool blanket and board insulation.

   B. Related Work: The following items are not included in this Section and are specified under the
      designated Sections:
      1. Section 092110 - GYPSUM BOARD ASSEMBLIES for acoustic insulation in gypsum
         board assemblies.
      2. Division 22 - PLUMBING for plumbing insulation.
      3. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for mechanical
         insulation.

1.3 SUBMITTALS
   A. Product Data: Manufacturer product data, installation instructions, performance criteria, and
      product limitations for each type of product indicated.

1.4 QUALITY ASSURANCE
   A. Source Limitations: Obtain each type of building insulation through one source from a single
      manufacturer.

   B. Surface-Burning Characteristics: As determined by testing identical products according to
      ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of
      applicable testing agency.

   C. Testing Agency Qualifications: An independent agency qualified as a “Certified Infrared
      Thermographer” per ASNT SNT-TC-1A guidelines, Level I certification minimum.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Protect insulation materials from physical damage and from deterioration by moisture, soiling,
      and other sources. Store in a dry and secure location. Comply with manufacturer's written
      instructions for handling, storing, and protecting during installation.
PART 2 - PRODUCTS

2.1 BLANKET INSULATION, MINERAL-WOOL BLANKET

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Owens Corning; Thermafiber UltraBatt FF.
2. Isolatek International.
3. Rockwool (formerly Roxul).

B. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Building Product Disclosure and Optimization, Material Ingredients: Health Product Declaration (HPD) or Declare product labels.

2.2 AUXILIARY INSULATING MATERIALS

A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2. Do not use adhesives that contain urea formaldehyde.
3. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.

B. Tape: Adhesive tape recommended by insulation manufacturer, to tape joints and tears in faced insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

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

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Glass-Fiber or Mineral-Wool 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.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports.

B. Infrared Camera Survey: Perform an infrared camera scan of walls, floors, and ceilings to determine where insulation and air barrier are not continuous, after insulation has been installed, but prior to plaster patching or new gypsum board installation.

1. Provide complete digital report with images of test results with recommendations for repairs.

C. Repair or replace work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

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 25 00
WEATHER BARRIERS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS
A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK
A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Building wrap.
B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
   1. Section 061600 - SHEATHING for sheathing joint and penetration treatment.

1.3 SUBMITTALS
A. 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.

B. Evaluation Reports: For water-resistive barrier, from ICC-ES.

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, provide one of the following:
      a. DuPont; Styrofoam Weathermate Plus Brand Housewrap.
      b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
      c. Reemay, Inc.; Typar HouseWrap.
   2. Water-Vapor Permeance: Not less than 75 g through 1 sq. m of surface in 24 hours 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.

C. Sill Sealer: Provide 1/4 inch uncompressed thickness, closed cell polyethylene foam plastic, with compressive strength of 1.0 psi, 1.5 to 2.2pcf density. Provide widths to coordinate with width of sill members used. Provide in continuous long rolls to minimize joints.

1. Acceptable Product: DuPont “Styrofoam Brand Sill Seal” or equal.

2.2 FLEXIBLE FLASHING AND RELATED MATERIALS

A. Acceptable Manufacturers:

1. Carlisle Coatings and Waterproofing; Miradri TWF.
2. Carlisle Coatings and Waterproofing; CCW 705 TWF.
4. GCP Applied Technologies (formerly W.R. Grace); VycorV40.

B. Provide composite membrane of minimum 32 mils of rubberized asphalt bonded to 8 mils of high density, cross-laminated polyethylene film to form a self-adhering membrane sheet flashing. Provide minimum 12 inch wide strips of flashing if not indicated otherwise.

C. Associated Materials: Provide all primers, sealers, surface conditioners, edge sealants, fillers, adhesives, cants, mastics, and other miscellaneous materials and accessories recommended by the flashing manufacturer. To ensure compatibility, provide only associated materials that are either supplied or approved in writing by the flexible flashing manufacturer.

D. Use Limitations and Metal Flashing Substitution: At the following locations and conditions, do not use specified membrane flexible flashing but provide break formed sheet metal flashing with fully soldered seams:

1. Wherever flashing would be exposed to sunlight.
2. Wherever flashing is not fully supported such as when spanning a cavity wall or unsupported open space.
3. At locations where sealant is adhered directly to the flashing.
4. Where flashing cannot be properly installed due to its self-adhesive properties. Window jambs may such a condition.
5. Wherever flashing is indicated or noted to be metal.
6. Wherever flashing would be in contact with creosote, coal tar, or polysulfide joint sealants.
7. Wherever substrate surface or ambient air temperature is below 25 degrees F.

E. Metal Flashing Supplements: Provide sheet metal flashing supplements at the following locations and elsewhere indicated:

1. Gaps: Provide minimum 6 inch wide strip of sheet metal under flexible membrane flashing to help support flexible flashing at gaps between continuous lintels and shelf angles.
2. Drips: Provide minimum 4 inch wide strip of sheet metal where the flexible flashing is indicated to protrude from the construction assembly and would be exposed to sunlight. Overlap the membrane flashing at least 2.5 inches onto the sheet metal and extend the sheet metal out of the construction assembly and form a drip. Provide butt joints between metal flashing membranes. Use longest practical lengths of metal flashing drip edges.
F. Sheet Metal Material - Copper: Minimum 16 ounce, ASTM B370 cold rolled copper.

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.
   1. Seal seams, edges, fasteners, and penetrations with tape.
   2. Extend into jambs of openings and seal corners with tape.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Vapor retarders at infill areas with new cast-in-place concrete.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 033000 - CAST-IN-PLACE CONCRETE.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from physical damage and from deterioration by 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.

PART 2 - PRODUCTS

2.1 VAPOR RETARDER

A. Basis-of-Design: Stego Wrap Vapor Retarder by Stego Industries LLC, or Perminator by W.R. Meadows, or Viper VaporCheck II 15 mil by ISI Building Products. Vapor retarder shall have the following qualities:

1. Permeance of less than 0.01 perms per ASTM F 1249 or ASTM E 96.
2. ASTM E 1745 Class A, with the permeance requirement modified to not exceed 0.01 perms both before and after conditioning.
3. Thickness: 15 mils.

B. Accessories:

1. Seam Tape: Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96.
2. Vapor Proofing Mastic: Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96.
3. Pipe Boots: Construct pipe boots from vapor retarder material, pressure sensitive tape and/or mastic per manufacturer’s instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

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

3.2 PREPARATION

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

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer’s written instructions.

3.4 PROTECTION

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

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Metal composite material (MCM) wall and soffit panels and attachment systems.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 054000 - COLD-FORMED METAL FRAMING for secondary support framing supporting metal panels.
2. Section 072100 - THERMAL INSULATION for insulation behind metal panels.
3. Section 077700 - WALL CLADDING SUPPORT SYSTEM.
4. Section 076200 - SHEET METAL FLASHING AND TRIM for copings, flashings, and other sheet metal work not part of metal panel assemblies.
5. Section 079200 - JOINT SEALANTS for field-applied sealants not otherwise specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal composite material panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: Provide metal composite material panel assemblies that comply with performance requirements specified as determined by testing manufacturers’ standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

C. Structural Performance: Provide metal composite material panel assemblies capable of withstanding the effects of gravity loads and loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330.

1. Wind Loads: As required by Code. [As indicated on Structural Drawings.]
2. Deflection Limits: Engineer metal wall panel assemblies to withstand test pressures with deflection no greater than 1/180 of the span and no evidence of material failure, structural distress, or permanent deformation exceeding 0.2 percent of the clear span, at code required loading.
D. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:


E. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:


F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing 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 (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.
3. Distinguish between factory- and field-assembled work.

C. Delegated-Design Submittal: For metal panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Composite Material Panels: 12 inches long by actual panel width. Include fasteners, closures, and other metal panel accessories.

   a. Include 4-way joint for panels.

2. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of metal panels adjacent to joint sealants.

E. Qualifications: Qualifications of Professional Engineer and Installer.

F. Product Test Reports: For each product, tests performed by a qualified testing agency.
G.  Field quality-control reports.

1.5  QUALITY ASSURANCE

A.  Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B.  Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the state the project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of panels that are similar to those indicated for this Project in material, design, and extent.

C.  Installer Qualifications: An employer of workers trained and approved by manufacturer.

   1.  Installer's responsibilities include fabricating and installing metal panel assemblies and providing professional engineering services needed to assume engineering responsibility.

D.  Fabricator Qualifications: Certified by metal panel manufacturer to fabricate and install manufacturer's wall panel system.

E.  Source Limitations: Obtain each type of metal panel through one source from a single manufacturer.

F.  Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

   1.  Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

G.  Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to metal panel assemblies including, but not limited to, the following:

   1.  Meet with The Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels including installers of doors, windows, and louvers.

   2.  Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

   3.  Review methods and procedures related to metal panel installation, including manufacturer's written instructions.

   4.  Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.

   5.  Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal panels.

   6.  Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.

   7.  Review temporary protection requirements for metal panel assembly during and after installation.

   8.  Review wall panel observation and repair procedures after metal panel installation.

   9.  Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.
H. Mockups: Provide mock-ups as specified in Section 014330 - MOCK-UPS, coordinate with other trades as required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store metal composite material panels vertically, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

1. Do not allow storage space to exceed 120 deg F.

D. Retain strippable protective covering on metal composite material panels during installation.

1.7 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal panel fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.8 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.

b. Deterioration of metals and other materials beyond normal weathering.
2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM 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 METAL COMPOSITE MATERIAL WALL PANELS

A. General: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.

B. Aluminum Composite Material Panels: Formed with 0.020-inch (0.50-mm) thick, aluminum sheet facings.

1. Acceptable Products: Subject to compliance with requirements, provide one of the following products:
   a. 3A Composites USA, Inc.; Alucobond Plus (Basis of Design, product specific Type III EPD).
   b. Arconic, Inc.; Reynobond FR.
   c. Alpolic Materials, a division of Mitsubishi; Alpolic/pe Alpolic/fr.
   d. Alucoil North America; Alucoil FR.
   e. Firestone Building Products, LLC; UNA-FAB Series 1500, with fire-rated core.

2. Panel Thickness: 0.157 inch (4 mm).
3. Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.

C. Attachment Assembly Components: Formed from extruded aluminum.

1. Include manufacturer's standard perimeter extrusions, panel stiffeners, panel clips and anchor channels.

D. Attachment Assembly: Manufacturer's standard rainscreen system.

2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation
unless otherwise indicated. Provide manufacturer’s standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers.

1. Match material, finish, and color as facings of adjacent panels, unless otherwise indicated.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

1. Comply with requirements of Section 079200 - JOINT SEALANTS.

2.3 RAINSCREEN ATTACHMENT SYSTEM

A. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch and depth required to fit insulation thickness indicated.

B. Rainscreen System: Provide system that has been tested in accordance with AAMA 508 (Pressure Equalized Rain Screen Wall Cladding Test) – Standard Test Method for Water Penetration of Exterior Vented Rainscreen Panel System. The test requires a minimum airflow of 1 CFM / SF of weather wall area through the vented rainscreen system to replicate severe storm and imperfection in air/vapor barrier system. While maintaining 1 CFM/SF airflow, the system must be able to pressure equalize and sustain zero pressure difference between the interior and exterior wall cavity without any water penetration.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Universe Systems, Division of Universe Corporation.
   b. LYMO Architectural Panel Systems Inc.
   c. POHL Inc. of America.
   e. Metal Sales & Service, Inc.

2. Rout and return wall panel system with dry joints for rainscreen assembly.
2.4 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

1. Factory form panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
2. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
3. Dimensional Tolerances:
   a. Length: Plus 0.375 inch.
   b. Width: Plus 0.188 inch.
   c. Thickness: Plus or minus 0.008 inch.
   d. Panel Bow: 0.8 percent maximum of panel length or width.
   e. Squareness: 0.2 inch maximum.

B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal panel manufacturer.

   a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. 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.

E. High-Performance Organic Finish (2-Coat Fluoropolymer Mica Finish System): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat, with color coat containing mica and not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.2 mil). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Metallic Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material panel manufacturer.

   a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

3. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.

B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

A. General: Install metal composite material panels according to manufacturer’s written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels
and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal panels is not permitted.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners, Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
2. Do not begin installation until weather barrier and flashings that will be concealed by metal panels are installed.

E. Rainscreen Installation: Install using manufacturer's standard assembly with vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach metal composite material wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated.

3.4 ACCESSORY INSTALLATION

A. Accessories, General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel
manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal panel installation, including accessories.

D. Remove and replace metal panels where tests and inspections indicate that they do not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.
B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Sheet metal flashing and trim for the following applications:
   a. Through-wall flashing.
   b. Formed wall flashing and trim.
   c. Formed low-slope roof flashing and trim.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood nailers, curbs, and blocking.
2. Section 079200 - JOINT SEALANTS for field-applied sheet metal flashing and trim sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting Wind Zone forces required by Code according to recommendations in FMG Loss Prevention Data Sheet 1-49.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

E. Interface with Other Systems:
1. Do not proceed with installation of flashing and sheet metal until completion of curb and substrate construction, cants, blocking, reglets and other construction required to receive flashing.

2. Coordinate flashing with other Work for correct sequencing of items comprising entire membrane or system of roofing or waterproofing and rain drainage.

1.4 SUBMITTALS

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

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:
   1. Identify material, thickness, weight, and finish for each item and location in Project.
   2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
   3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
   4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
   1. Sheet Metal Flashing: 12 inches long. Include fasteners, cleats, clips, closures, and other attachments.
   2. Trim: 12 inches long. Include fasteners and other exposed accessories.
   3. Accessories: Full-size Sample.

1.5 QUALITY ASSURANCE

A. Sheet Metal Flashing and Trim Standard: Comply with SMACNA’s “Architectural Sheet Metal Manual.” Conform to dimensions and profiles shown unless more stringent requirements are indicated.

B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
   1. Meet with the Owner, Architect and Owner’s insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
   2. Review methods and procedures related to sheet metal flashing and trim.
   3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
   4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with suitable weathertight and ventilated covering. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1.7 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005. Thickness as specified in this Section. Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

1. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

   a. Available Products: Sherwin-Williams Coil Coatings; Valspar Fluoropon Pure; or approved equal.

   1) Building Product Disclosure and Optimization, Material Ingredients: Declare product label.

   b. Color and Gloss: As selected by Architect from manufacturer's full range.

B. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, with No. 2D dull, cold-rolled finish. Thickness as specified in this Section.

2.2 UNDERLAYMENT MATERIALS

A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.

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

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
1. Exposed Fasteners: Heads matching color of sheet metal by means of plastic caps or factory-applied coating.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex washer head.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

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

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

G. Isolation Coating: ASTM D 1187, cold-applied asphalt emulsion, VOC compliant, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.


2.4 FABRICATION, GENERAL

A. General: Custom 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 item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

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

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength. Provide 2 in. min. end dams at terminations (riveted and sealed watertight).

2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

3. Soldered Seams in Stainless Steel: Prefabricated inside and outside corners and 2 in. min. end dams at terminations (riveted and soldered watertight).

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.
G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
   1. Thickness: As recommended by SMACNA’s "Architectural Sheet Metal Manual" for application but not less than thickness of metal being secured.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing (Gravel Stop) and Fascia Caps: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Furnish with 6-inch-wide joint cover plates.
   2. Fabricate from the following material:
      a. Aluminum: 0.050 inch (1.27 mm) thick.

B. Copings: Fabricate in minimum 96-inch-long, but not exceeding 10-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, seal, and solder or weld watertight.
   2. Fabricate copings from the following material:
      a. Aluminum: 0.050 inch (1.27 mm) thick.

C. Roof and Roof to Wall Transition Expansion-Joint Cover: Fabricate from the following material:
   1. Stainless Steel: 0.025 inch (0.64 mm) thick.

D. Base Flashing: Fabricate from the following material:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

E. Counterflashing: Fabricate from the following material:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

F. Roof-Penetration Flashing: Fabricate from the following material:
   1. Stainless Steel: 0.019 inch (0.48 mm) thick.

G. Roof-Drain Flashing: Fabricate from the following material:
   1. Stainless Steel: 0.016 inch (0.40 mm) thick.

H. Splash Pans: Fabricate from the following material:
   1. Stainless Steel: 0.025 inch thick.

2.6 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing, Typical: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12 foot long, sections, under copings, at shelf angles, and where indicated.
Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings. Form with 2-inch-high end dams. Fabricate from the following material:

1. Stainless Steel: 0.016 inch (0.40 mm) thick.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: 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 substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system. Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer installation instructions, and SMACNA “Architectural Sheet Metal Manual”. Anchor units work of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints and seams that will be permanently watertight and weatherproof.

1. Torch cutting of sheet metal flashing and trim is not permitted.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Coat side of stainless-steel sheet metal flashing and trim with isolation coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitous or wood substrates, install a course of felt underlayment and cover with a slip-sheet or install a course of polyethylene underlayment.

C. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

D. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and elastomeric sealant.

E. 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.
   1. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

F. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.

G. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
   1. Aluminum: Use aluminum or stainless steel fasteners.
   2. Stainless Steel: Use stainless-steel fasteners.

H. Seal joints with elastomeric sealant as required for watertight construction.
   1. Where sealant-filled joints are used, 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 moderate, between 40 and 70 deg F set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
   2. Prepare joints and apply sealants to comply with requirements in Section 079200 - JOINT SEALANTS.

I. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pretin edges of sheets to be soldered to a width of 1-1/2 inches except where pretinned surface would show in finished Work.
   1. Do not solder aluminum sheet.
   2. Stainless-Steel Soldering: Pretin edges of uncoated sheets to be soldered using solder recommended for stainless steel and phosphoric acid flux. Promptly wash off acid flux residue from metal after soldering.
   3. Do not use open-flame torches for soldering. Heat surfaces to receive solder and flow solder into joints. Fill joints completely. Completely remove flux and spatter from exposed surfaces.

J. Aluminum Flashing: Rivet or weld joints in uncoated aluminum where necessary for strength.
3.3 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless steel draw band and tighten.

C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with elastomeric sealant.


D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Install flashing as follows:

1. Seal with elastomeric sealant and clamp flashing to pipes penetrating roof except for flashing on vent piping.

3.4 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.5 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain in a clean condition during construction.

D. 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 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Roof-edge drainage systems.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood nailers, curbs, and blocking.
2. Section 079200 - JOINT SEALANTS for sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.4 SUBMITTALS

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

B. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:

1. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
2. Pattern of seams and layout of fasteners, cleats, clips, and other attachments.
3. Details of termination points and assemblies, including fixed points.
4. Details of special conditions.
C. Samples for Verification: For roof-edge drainage systems made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.5 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

A. Aluminum Sheet: ASTM B 209, Alloy 3003, 3004, 3105, or 5005. Thickness as specified in this Section. Temper suitable for forming and structural performance required, but not less than H14, finished as follows:

1. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Fluoropolymer 3-Coat System: Manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight, with a minimum total dry film thickness of 1.5 mil; complying with AAMA 2605.

   1) Color: As selected by Architect from manufacturer's full range.

2.2 CONCEALED METALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
B. Fasteners: Manufacturer’s recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.

C. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ATAS International, Inc.
2. Berger Building Products, Inc.
3. Cheney Flashing Company.
4. Hickman Company, W. P.
5. Merchant & Evans, Inc.
6. Metal-Era, Inc.
7. Metal-Fab Manufacturing, LLC.
8. MM Systems Corporation.

B. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Fabricate from the following exposed metal:
   a. Aluminum: 0.050 inch (1.27 mm) thick.

2. Gutter Profile: As indicated according to SMACNA's "Architectural Sheet Metal Manual."
4. Gutter Supports: As indicated with finish matching the gutters.
5. Gutter Accessories: Bronze wire ball downspout strainer,

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

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

3.2 INSTALLATION, GENERAL

A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.


1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that will 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. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F

3.3 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and solder to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
3.4 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder and sealants.

C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION
SECTION 07 84 10

PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 079200 - JOINT SEALANTS for standard joint sealers.
2. Division 21 - FIRE SUPPRESSION for cutting penetrations for fire-suppression piping and providing firestopping complying with requirements in this Section.
3. Division 22 - PLUMBING for cutting penetrations for plumbing piping and providing firestopping complying with requirements in this Section.
4. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for cutting penetrations for ductwork and HVAC piping and providing firestopping complying with requirements in this Section.
5. Division 25 - INTEGRATED AUTOMATION for cutting penetrations for cable and conduit and providing firestopping complying with requirements in this Section.
6. Division 26 - ELECTRICAL for cutting penetrations for cable and conduit and providing firestopping complying with requirements in this Section.
7. Division 27 - COMMUNICATIONS for cutting penetrations for cable and conduit and providing firestopping complying with requirements in this Section.
8. Division 28 - ELECTRONIC SAFETY AND SECURITY for cutting penetrations for cable and conduit and providing firestopping complying with requirements in this Section.

1.3 COORDINATION

A. Jobsite conditions of each through-penetration firestop system must meet all details of the UL-Classified System selected. If jobsite conditions do not match any UL-classified systems, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.

B. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations.

C. Verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.
1.4 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 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: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping:

1. Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
2. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
   a. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems demonstrating no evidence of water leakage when tested according to UL 1479.
   b. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.

F. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

1. Types of penetrating items.
2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistant joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
   a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
   b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL "Fire Resistance Directory."

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to the following:

1. Hilti, Inc.
2. BioFireshield; RectorSeal Corporation.
4. 3M; Fire Protection Products Division.

2.2 FIRESTOPPING MATERIALS

A. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:
1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.
4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

C. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

D. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the approved Through-Penetration Firestop System Schedule submittal. Fill materials are those referred to in directories of referenced testing and inspecting agencies as “fill,” “void,” or “cavity” materials.

1. Available Products:
   a. BioFireshield; RectorSeal Smoke and Acoustic Sealant.
   b. Hilti; CP 606 Flexible Firestop Sealant.
   c. Hilti; CP 653 BA Firestop Speed Sleeve.
   d. Hilti; FS-ONE Intumescent Firestop Sealant.

E. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 “Performance Requirements” Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

F. Endothermic Mats: 3M Interam Endothermic Mats by 3M Fire Protection Products; located in rated walls behind cabinet unit heaters, fire extinguisher cabinets and electrical panels where there are space limitations to maintain the wall rating.

2.3 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop 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 work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system 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 through-penetration firestop systems.

2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer’s recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer’s written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing 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 indicated.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports, as required by 2015 IBC 1705.17 and 1705.17.1. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.

B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop 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 through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

END OF SECTION
SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Joint sealants and fillers.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 088000 - GLAZING for glazing sealants.
2. Section 092110 - GYPSUM BOARD ASSEMBLIES for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
3. Section 093000 - TILING for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
4. Section 095100 - ACOUSTICAL CEILINGS for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

A. Product Data: For each product indicated.

B. Samples for Verification: For each type 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.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
D. Qualification Data: For Installer and qualified testing agency.

E. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

F. Preconstruction Field Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on preconstruction testing specified in "Quality Assurance" Article.

G. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

H. Field Test Report Log: For each elastomeric sealant application.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.

B. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

D. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
      a. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
      b. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with joint sealant backing and glazing and gasket materials.
   2. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   3. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   4. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:
   a. Each type of elastomeric sealant and joint substrate indicated.
   b. Each type of nonelastomeric sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
      1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

4. Report whether sealant in joint connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.

5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric 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's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those 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 natural 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 MATERIALS, 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 sealant manufacturer, based on testing and field experience.

B. Low-Emitting Materials: Interior sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. VOC Content: Provide interior sealants and sealant primers that comply with the following limits for VOC content:

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.
4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

D. Colors of Exposed Joint Sealants: Provide colors as selected by the Architect from manufacturer’s full range of standard and custom colors; maximum of five colors, three standard colors and two custom colors.

2.2 JOINT SEALANTS

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

B. Stain-Test-Response Characteristics: Elastomeric sealants shall be nonstaining to porous substrates. Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

C. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600 or ANSI/NSF Standard 51.

D. Exterior Silicone Sealant, Single-Component Neutral-Curing Type:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Dow Corning Corporation; 790.
2. Extent of Use: Exterior joints in vertical and soffit surfaces.

E. Exterior Urethane Sealant, Multicomponent Pourable (Self-Leveling) Type for Pedestrian Traffic: ASTM C 920, Type M, Grade P, Class 25, Use T, M, & O.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Meadows, W. R., Inc.; POURTHANE.
   b. Pecora Corporation; Urexpan NR-200.
   c. Sika; Sikaflex-2c SL.
   d. Tremco Inc.; THC-901.

2. Extent of Use: Exterior joints in horizontal surfaces.

F. Interior Sanitary Silicone Sealant, Single-Component Mildew-Resistant, Acid-Curing (Acetoxy) Type: ASTM C 920, Type S, Grade NS, Class 25, Use NT, G, A, and O.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Bostik; Pure Silicone.
   b. Dow Corning Corporation; 786 Mildew Resistant.
   c. GE Silicones; Sanitary SCS1700.
   d. Pecora; 898NST.
   e. Sika; Sikasil GP.
   f. Tremco; Tremsil 200.

2. Extent of Use: Interior sanitary joints at toilet rooms, kitchens, and other wet areas.

G. Interior Acrylic Latex Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

   a. Henkel Corp.; Loctite Polyseamseal Acrylic Caulk with Silicone.
   b. Pecora Corporation; AC-20+.
   c. Tremco Inc.; Tremflex 834.

2. Extent of Use: Interior non-moving joints.

2.3 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 B (bicellular material with a surface skin) or other type, as approved in writing by joint-sealant manufacturer for joint application indicated,
and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Available Products: Armacell Canada Inc.; ITP Standard Backer Rod; or approved equal.

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 where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 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 joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions 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, blast cleaning, 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. Porous joint substrates include concrete, masonry, unglazed surfaces of ceramic tile, and exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following metal, glass, porcelain enamel, and glazed surfaces of ceramic tile.
B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on 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 with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type 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 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:
a. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Standard hollow metal steel doors and frames.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 087100 - DOOR HARDWARE for door hardware for steel doors.
2. Section 092110 - GYPSUM BOARD ASSEMBLIES for insulation.
3. Section 099000 - PAINTING AND COATING for field painting steel doors and frames.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, temperature-rise ratings, and finishes for each type of steel door and frame specified.

B. Shop Drawings:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.
1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

   1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

   2. Temperature-Rise Limit: Fire door assemblies in interior exit stairways and ramps and exit passageways shall have a maximum transmitted temperature rise of not more than 450 degrees F (250 degrees C) above ambient at the end of 30 minutes of standard fire test exposure. Exception: The maximum transmitted temperature rise is not required in buildings equipped throughout with an automatic sprinkler system installed in accordance with IBC Section 903.3.1.1 or 903.3.1.2.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

   1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages 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.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ceco Door Products; an ASSA ABLOY Group Company.
2. CURRIES Company; an ASSA ABLOY Group Company.
3. de LaFontaine
4. Steelcraft; an Allegion (formerly Ingersoll-Rand) company.

2.2 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, (Galvanized/Galvannealed) Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60/A60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z 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. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Insulation: Comply with requirements in Section 092110 - GYPSUM BOARD ASSEMBLIES.

H. Environmental Product Declarations (EPD): Product-specific Type III EPDs for hollow metal doors and frames are available from manufacturers listed herein.


2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
   a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
   b. Thermal-Rated (Insulated) Exterior Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 2.5 when tested according to ASTM C 1363.
3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets.

B. Exterior Doors: Face sheets fabricated from metallic-coated (galvanized/galvannealed) steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
   1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
   1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

   1. Fabricate frames with full profile welded joints.
   2. Frames for Level 3 Steel Doors: 0.067-inch-thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet.
   1. Fabricate frames with full profile welded joints.
   2. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:
1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.

3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

4. 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, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.7 LOUVERS

A. Provide louvers for interior doors, where indicated, that comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

1. Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
2. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.

2.9 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 thickness of metal. 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. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.

D. 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. Full Profile Welded Frames: Weld joints continuously; grind, fill, dress, and make smooth, flush, and not visible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as doorframe. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry 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) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
   b. 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) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
      5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
   c. Compression Type: Not less than two anchors in each jamb.
   d. 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.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b.Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door
Hardware Schedule and templates furnished as specified in Section 087100 - DOOR HARDWARE.

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 - ELECTRICAL.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard epoxy primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2. Refer to Section 099000 – PAINTING AND COATING for field-applied coating.

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. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
3.3 INSTALLATION

A. General: 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 of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. At fire-protection-rated openings, install frames according to NFPA 80.
   b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   d. Check plumbness, squareness, 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.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

4. Masonry Walls: Coordinate installation of frames to allow for filling space between frames and masonry with insulation.
5. Concrete Walls: Solidly fill space between frames and concrete with insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. 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 Standard Steel Doors:
   a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
   c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

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. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

C. Metallic-Coated (Galvanized/Galvannealed) Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION
SECTION 08 14 00
FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Solid-core with wood veneer faces for transparent and opaque finishes.
2. Factory finishing for wood doors with transparent finish.
3. Factory fitting flush wood doors to frames and factory machining for hardware.
4. Louvers and glass lites for flush wood doors.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 087100 - DOOR HARDWARE for hardware for wood doors.
2. Section 088000 - GLAZING for glass and glazing requirements.
3. Section 099000 - PAINTING AND COATING for field finishing of opaque wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of product, including the following:

1. Door core and edge construction and face type.
2. Factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:

1. Door schedule indicating door and frame location, type, size, and swing.
2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and louver and glazing thicknesses.
3. Details of frame for each frame type, including dimensions and profile.
4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
5. Dimensions and locations of blocking for hardware attachment.
6. Dimensions and locations of mortises and holes for hardware.
7. Clearances and undercuts.
8. Requirements for veneer matching.
9. Doors to be factory primed or finished and application requirements.

C. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of finish color, sheen, and grain to be expected in finished work.

D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

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 top rail with opening number used on Shop Drawings.

1.6 PROJECT 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 temperature and relative humidity at levels designed for building occupants for the remainder of construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

2. Warranty shall include hardware installation and replacement of glass and glazing.

3. Warranty shall be in effect during the following period of time from date of Substantial Completion:

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Lambton Doors; EnviroDesign Series.
2. Masonite Architectural; Aspiro and Graham Series (formerly Algoma and Marshfield).
3. Oregon Doors; Architectural Series.
4. VT Industries Inc.; Eggers and Heritage collections.

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Finish:

1. Grade: AWI Premium, with AWI Grade A faces, 4 inch veneer width.
2. Species and Cut: Select White Maple, rotary cut.
4. Assembly of Veneer Leaves on Door Faces: Balance match.
5. Pair and Set Match: Provide for doors hung in same opening.
6. Exposed Vertical Edges: Same species as faces – edge Type A.
7. Transom Match: Continuous match.
8. Stiles: Same species as face.
10. Adhesives: WDMA T.M.-6, Type I.

B. Doors for Opaque Finish:

1. Grade: Premium.
2. Faces for Interior Doors: Either medium-density overlay (MDO) or high-density fiberboard (HDF).
5. Adhesives: WDMA T.M.-6, Type I.

2.3 SOLID-CORE DOORS

A. Cores: Comply with the following requirements:

1. Composite Wood, General: CARB II compliant or made with binder containing no added formaldehyde (NAF).
2. Particle Core: ANSI A 208.1, Grade 1-LD-2.
4. Structural Composite Lumber Core: WDMA I.S.10, Timberstrand LSL.

B. Interior Veneer-Faced Doors:

1. Construction: Five plies, hot-pressed, with stiles and rails bonded to core, then entire unit abrasive planed before veneering.
2.4 GLAZING SYSTEMS

A. Glazing: Provide factory installed glass products in accordance with requirements in Section 088000 - GLAZING.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

B. 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, ANSI/BHMA/DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining. Drill pilot holes for screws for butt hinges and lock fronts at the factory.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

1. Fabricate door and transom panels with full-width, solid-lumber meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal doorframes.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.
3. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 - GLAZING.

2.6 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Doors for Opaque Finish: Factory prime faces and edges of doors, including cutouts, with one coat of wood primer specified in Section 099000 - PAINTING AND COATING.

C. Doors for Transparent Finish: Factory finish doors that are indicated to receive transparent finish. Finish faces and edges of doors, including cutouts.

D. Transparent Finish:

1. Grade: Premium.
2. Finish: AWS System-9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.
   1. Verify that 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. Hardware: For installation, see Section 087100 - DOOR HARDWARE.

B. Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
   1. Install smoke- and draft-control doors according to NFPA 105.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 FIELD QUALITY CONTROL

A. Inspection Agency: Engage a qualified inspector to perform inspections and to furnish reports to Architect.

B. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

C. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Protection: Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

C. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION
SECTION 08 31 10
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Access doors and frames for walls and ceilings.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 087100 - DOOR HARDWARE for rim cylinder locks and master keying.

1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each door face material, at least 3 by 5 inches in size, in specified finish.

D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of access door and frame through one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 for vertical access doors and frames.
2. ASTM E 119 for horizontal access doors and frames.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 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 schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Steel Sheet: Electrolytic zinc-coated, ASTM A 879/A 879M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."


2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

D. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 STAINLESS-STEEL MATERIALS

A. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.

B. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316. Remove tool and die marks and stretch lines or blend into finish.

1. Finish: Directional Satin Finish, No. 4.

2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acudor Products, Inc.
2. Babcock-Davis.
4. JL Industries (a division of Activar Construction Products Group).
7. Milcor Inc.
8. Nystrom, Inc.

B. Flush Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch-thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead flange.
4. Hinges: Continuous piano.
5. Lock: Cylinder.

   a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE.

C. Recessed Access Doors and Trimless Frames: Fabricated from steel sheet at typical areas and from stainless-steel sheet at toilet and wet areas.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch-thick sheet metal in the form of a pan recessed 5/8 inch for gypsum board infill.
3. Frame: Minimum 0.060-inch-thick sheet metal with drywall bead for gypsum board surfaces.
5. Lock: Cylinder.

   a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE.

D. Fire Rated, Uninsulated, Flush Access Doors and Frames with Exposed Trim: Fabricated from steel at typical areas and from stainless-steel sheet at toilets and wet areas.

1. Locations: Wall surfaces.
2. Fire-Resistance Rating: Not less than that of adjacent construction.
3. Door: Minimum 0.060-inch-thick sheet metal, flush construction.
4. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
5. Hinges: Continuous piano.
7. Lock: Self-latching device with cylinder lock.

   a. Lock Preparation: Prepare door panel to accept cylinder specified in Section 087100, DOOR HARDWARE.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. For trimless frames with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
   2. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
   3. Provide mounting holes in frames for attachment of units to metal framing.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.
   1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder lock, furnish two keys per lock and key all locks alike.
   2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

PART 3 - EXECUTION

3.1 INSTALLATION
   A. Comply with manufacturer's written instructions for installing access doors and frames.
   B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
   C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING
   A. Adjust doors and hardware after installation for proper operation.
   B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION
SECTION 08 41 10
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior aluminum-framed storefronts.
2. Interior manual-swing aluminum doors.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 079200 - JOINT SEALANTS for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.
2. Section 087100 - DOOR HARDWARE for lock cylinders and keying.
3. Section 088000 - GLAZING for glazing requirements to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design entrance and storefront system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Failure includes the following:

   a. Deflection exceeding specified limits.
   b. Thermal stresses transferred to building structure.
   c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
   d. Noise or vibration created by wind and thermal and structural movements.
   e. Loosening or weakening of fasteners, attachments, and other components.
   f. Sealant failure.
   g. Failure of operating units to function properly.
C. Structural Loads: Wind and seismic loads as indicated on the Structural Drawings, but not less than that required by Code.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller, amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below to less than 1/8 inch and clearance between members and operable units directly below to less than 1/16 inch.

1.4 SUBMITTALS

A. Product Data: Include installation instructions, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated. Indicate special procedures and perimeter conditions requiring special attention.

B. Shop Drawings: Prepared under the supervision of a qualified professional engineer detailing fabrication and assembly of aluminum-framed systems. For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
2. Include structural analysis of story drift and deflection from anticipated live loads, and determination whether head receptors are required.
3. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
4. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
5. Wiring diagrams for power, signal, and control wiring.
6. Activation and safety devices.
7. Include full-size isometric details of each vertical-to-horizontal intersection of storefronts, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions
   d. Glazing
   e. Flashing and drainage.

8. Include details showing interface with perimeter conditions to depict interface with adjacent thermal, weather, air and vapor barriers, and adjacent flashings.
9. Shop drawings must be signed and stamped by a professional engineer.

C. Delegated-Design Submittal: For entrance and storefront systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation. Show structural testing for attachment of the storefront to the existing structure. Contractor should survey slab edge locations and conditions of the embeds to develop the attachment details.
D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Qualification Data: For Installer.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

G. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of entrance and storefront systems that are similar to those indicated for this Project in material, design, and extent.

C. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

D. Accessible Entrances: Comply with authorities having jurisdiction, local state building code and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

E. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to storefront system, including, but not limited to, the following:

1. Review structural load limitations.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing, inspection, and certifying procedures.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
1. Warranty Period: 10 years from date of Substantial Completion.

B. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including, but not limited to, excessive deflection.
   b. Faulty operation of operators, controls, and hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Storefront, 2 inch by 4-1/2 inch profile:

2. Doors, Medium Stile:
   a. EFCO Corporation, D-300.
   c. Oldcastle BuildingEnvelope, MS-375.
   d. Tubelite Inc., Medium.
   e. YKK AP America Inc., 35D.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.
2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
   2. Reinforce members as required to receive fastener threads.
   3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

A. Glazing: As specified in Section 088000 - GLAZING.

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.5 DOORS

A. Doors: Manufacturer's standard glazed doors, for manual swing operation.
   1. Door Construction: Mechanical clip fastening, SIGMA deep penetration plus welds and 1-1/8 inch long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type and EPDM glazing gaskets reinforced with non-stretchable cord.

2.6 DOOR HARDWARE

A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.
   1. Opening-Force Requirements:
a. Egress Doors: Not more than 30 lbf required to set door in motion and not more than 15 lbf required to open door to minimum required width.
b. Accessible Interior Doors: Not more than 5 lbf.

B. Hardware Sets: Provide as specified in Section 087100 - DOOR HARDWARE.

C. Pivot Hinges: BHMA A156.4, Grade 1.

D. Locking Devices, General: Do not require use of key, tool, or special knowledge for operation.
   1. Opening-Force Requirements:
      a. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force of not more than 15 lbf (67 N) for not more than 3 seconds.
      b. Latches and Exit Devices: Not more than 15 lbf (67 N) required to release latch.

E. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

F. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

G. Cylinders: As specified in Section 087100 - DOOR HARDWARE.

H. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

I. Operating Trim: BHMA A156.6.

J. Closers: With accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use, and adjustable to meet field conditions and requirements for opening force.
   1. Standard: BHMA A156.4, Grade 1.

K. Concealed Overhead Holders: BHMA A156.8, Grade 1.

L. Surface-Mounted Holders: BHMA A156.16, Grade 1.

M. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

N. Silencers: BHMA A156.16, Grade 1.

O. Thresholds: Raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (13 mm).

P. Finger Guards: Manufacturer’s standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.
2.7 ACCESSORY MATERIALS

A. Insulating Materials: As specified in Section 072100 - THERMAL INSULATION.

B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 - JOINT SEALANTS.

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

F. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

G. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.
2.9 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color coat, with color coat containing not less than 70 percent polyvinylidene fluoride resin by weight). Coatings shall be fluorosurfactant free Kynar 500 by Arkema or fluorosurfactant-compliant Hylar 5000 by Solvay; or equal. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Available Products: Sherwin-Williams Coil Coatings; Valspar Fluropon Pure; or approved equal.
3. Metallic Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 - JOINT SEALANTS and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing as specified in Section 088000 - GLAZING.

1. Structural-Sealant Glazing:
   a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
   b. Install weatherseal sealant according to Section 079200 - JOINT SEALANTS and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:
   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under Part 1 "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft., and shall not evidence water penetration.

3. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

1. For doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch measured to the leading door edge.

END OF SECTION
SECTION 08 54 13
FIBERGLASS WINDOWS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within
DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of
the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this
Section, including but not limited to the following:

1. Fixed fiberglass windows with factory-installed glass and glazing.

B. Related Work: The following items are not included in this Section and are specified under the
designated Sections:

1. Section 076200 - SHEET METAL FLASHING AND TRIM.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide windows capable of complying with performance requirements indicated,
based on testing manufacturer’s windows that are representative of those specified and that are
of test size indicated below:


B. AAMA/NWWDA Performance Requirements: Provide windows of the performance class and
grade indicated that comply with AAMA/NWWDA 101/I.S.2.

1. Performance Class: Heavy Commercial HC40 for fixed.
2. Performance Grade: Minimum for performance class indicated.
3. Exception to AAMA/NWWDA 101/I.S.2: In addition to requirements for performance
class and performance grade, design glass framing system to limit lateral deflections of
glass edges to less than 1/175 of glass-edge length or 3/4 inch whichever is less, at
design pressure based on the following:

C. Structural Performance: Provide windows capable of withstanding the following, including wind
loads based on passing AAMA/NWWDA 101/I.S.2, Uniform Load Structural Test, at basic wind
speed indicated and as required by Code:

1. Deflection: Design glass framing system to limit lateral deflections of glass edges to less
than 1/175 of glass-edge length or 3/4 inch, whichever is less, at design pressure based
on structural computations.
2. Wind and Seismic Loads: As indicated on the Structural Drawings, but not less than that
required by Code.
3. Movements of supporting structure including, but not limited to, story drift and deflection
from uniformly distributed and concentrated live loads of ____ inches. Deflection over
_____ inches will require special considerations including but not limited to head receptors.

D. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA 101/I.S.2, Air Infiltration Test.

   1. Maximum Rate: As required by Code.

E. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.

   1. Test Pressure: 15 percent of positive design pressure, but not less than 2.86 lbf/sq. ft. or more than 12 lbf/sq. ft.

F. Condensation-Resistance Factor: Provide windows tested for thermal performance according to AAMA 1503, showing a CRF of 52 where windows are indicated to be "thermally improved."

G. Thermal Transmittance: Provide windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

   1. U-Value: As required by Code. Submit proof of compliance with submittals as specified.

H. Solar Heat-Gain Coefficient: Provide windows with a whole-window SHGC maximum as required by Code, determined according to NFRC 200 procedures. Submit proof of compliance with submittals as specified.

I. Thermal Movements: Provide windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:

   1. Mullion details, including reinforcement and stiffeners.
   2. Joinery details.
   4. Flashing and drainage details.
   5. Glazing details.
   7. Window System Operators: Show locations, mounting, and details for installing operator components and controls.
8. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation and used to determine the following:
   
a. Structural test pressures and design pressures from basic wind speeds indicated.
b. Deflection limitations of glass framing systems.

C. Samples for Verification: Full-size window of each type of window.

D. Qualification Data: For Installer, professional engineer and testing agency.

E. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by Contractor.

F. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of window. Test results based on use of down-sized test units will not be accepted.

G. Performance Reports: Based on systems, components and glazing methods proposed for use on this Project, proof that windows as glazed for this Project meet or exceed Code requirements for the following:
   
1. U-value.
2. Solar heat-gain coefficient.

H. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An installer acceptable to window manufacturer for installation of units required for this Project.

B. Source Limitations: Obtain windows through one source from a single manufacturer.

C. Product Options: Information on Drawings and in Specifications establishes requirements for windows’ aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

D. Fenestration Standard: Comply with AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
   
1. Provide AAMA certified windows with an attached label.

E. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA’s "Glazing Manual" unless more stringent requirements are indicated.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Build mockup for types of windows indicated, in locations shown on Drawings.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to windows including, but not limited to, the following:

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing and inspecting procedures.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failure to meet performance requirements.
2. Structural failures including excessive deflection.
3. Water leakage, air infiltration, or condensation.
4. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
5. Insulating glass failure.

B. Warranty Period: Twenty years from date of Substantial Completion.

C. Warranty Period for Fiberglass Finishes: Ten years from date of Substantial Completion.

D. Warranty Period for Glass: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide products Marvin Essential or comparable product by one of the following:

1. Armaclad Windows and Doors, Div. of Sound Solutions, Inc.
2. Fibertec Window & Door Mfg.
3. Inline Fiberglass Ltd.
4. Pella Corporation.
2.2 MATERIALS

A. Frame and sash profiles are made from pultruded fiberglass, nominal wall thickness of 0.090 in., with a minimum glass content of 60%. Non-structural accessory members are permitted to be in vinyl or aluminum and are identified as such.

2.3 GLAZING

A. Insulating-Glass Units for Vertical Glazing: 1 inch thick insulating glass consisting of two lites of 1/4 inch glass, low e coating on the No. 2 surface and argon gas filled. Provide one of the following or equal:

1. VE1-2M by Viracon.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.25.
   d. Shading Coefficient: 0.43.
   e. Solar Heat Gain Coefficient: 0.37.

2. Solarban 60 by PPG Industries.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.29.
   d. Shading Coefficient: 0.44.
   e. Solar Heat Gain Coefficient: 0.38.

3. SN-68 by Guardian Industries.
   b. Reflectance Visible Light: 10 percent.
   c. U Value (Winter): 0.29.
   d. Shading Coefficient: 0.43.
   e. Solar Heat Gain Coefficient: 0.37.

B. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

2.4 HARDWARE

A. Hardware Requirements: Provide hardware that complies with AAMA/NWWDA 101/I.S.2.

2.5 FABRICATION

A. General: Fabricate fiberglass windows, in sizes indicated, that comply with AAMA/NWWDA 101/I.S.2 for performance class and performance grade indicated. Include a complete system for assembling components and anchoring windows.

B. Construction: Connect frame and sash corners with molded reinforced polymer shearblocks and mechanical fasteners. Factory seal and neatly fit joints. Fill the perimeter of open-back frames with insulation and injected urethane foam in four corners.

C. Weep Holes: Provide concealed weep holes and internal passages to conduct infiltrating water to exterior.
D. Mullions: Provide mullions and cover plates as shown, 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, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

E. Aluminum Brake Metal Trim Work: Provide aluminum brake metal work in conjunction with aluminum windows. Fabricate brake-metal work from minimum 0.062 in. thick aluminum sheet, finished to match windows.

F. Factory-Glazed Fabrication: Glaze fiberglass windows in the factory where practical and possible for applications indicated. Comply with AAMA/NWWDA 101/I.S.2.

2.6 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.

2.7 FINISHES

A. Finish System: Manufacturer's standard isocyanate-free, two part polymer enamel with 1.5 mm minimum dry film thickness and medium gloss of 25-55; complying with ASTM 613 Organic coatings.
   1. Color and Gloss: As selected by Designer from manufacturer's full range.

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; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.
   1. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

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

3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.
C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Metal Protection: Separate aluminum and other corrodable surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
2. Air-Infiltration Testing:
   b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.

3. Water-Resistance Testing:
   b. Allowable Water Infiltration: No water penetration.

4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.

5. Test Reports: Prepared according to AAMA 502.

C. Remove and replace noncomplying windows and retest as specified above.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust operating sashes and ventilators, screens, hardware, operators, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

3.5 PROTECTION AND CLEANING

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits,
stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION
SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Sliding doors.

B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Automatic operators.
   4. Cylinders specified for doors in other sections.

C. Related Sections:
   1. Division 06 Section “Rough Carpentry”.
   2. Division 06 Section “Finish Carpentry”.
   3. Division 08 Section “Hollow Metal Doors and Frames”.
   4. Division 08 Section “Flush Wood Doors”.
   5. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.
   6. Division 28 Section “Access Control Hardware Devices”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
   8. State Building Codes, Local Amendments.
E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437 - Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.
   h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
   a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
   b. Complete (risers, point-to-point) access control system block wiring diagrams.
   c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:
   1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity.
Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through current members of the manufacturer's "Power Operator Preferred Installer" program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

G. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.

H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.

2. Plans for existing and future key system expansion.

3. Requirements for key control storage and software.

4. Installation of permanent keys, cylinder cores and software.

5. Address and requirements for delivery of keys.

I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.

3. Review sequence of operation narratives for each unique access controlled opening.

4. Review and finalize construction schedule and verify availability of materials.

5. Review the required inspecting, testing, commissioning, and demonstration procedures
J. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
D. Special Warranty Periods:

1. Ten years for mortise locks and latches.
2. Seven years for heavy duty cylindrical (bored) locks and latches.
3. Five years for exit hardware.
4. Twenty five years for manual overhead door closer bodies.
5. Five years for motorized electric latch retraction exit devices.
6. Two years for electromechanical door hardware, unless noted otherwise.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

   a. Two Hinges: For doors with heights up to 60 inches.
   b. Three Hinges: For doors with heights 61 to 90 inches.
   c. Four Hinges: For doors with heights 91 to 120 inches.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:
   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

5. Manufacturers:
   a. Hager Companies (HA).
   b. Ives (IV).
   c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).

B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge with minimum 0.120-inch thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cutouts.

1. Manufacturers:
   a. Hager Companies (HA).
   b. Ives (IV).
   c. Pemko (PE).

C. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should comply with ANSI/BHMA A156.14.

1. Pocket Sliding Door Hardware: Rated for doors weighing up to 200 lb.

2. Manufacturers:
   a. Hager Companies (HA).
   b. Johnson Hardware (JO).
   c. Pemko (PE).
2.3 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:
   a. Pemko (PE) - EL-CEPT Series.
   b. Securitron (SU) - EL-CEPT Series.
   c. Von Duprin (VD) - EPT-10 Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:
   a. Hager Companies (HA) - Quick Connect.
   b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - QC-C Series.

2.4 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
   a. Door Controls International (DC).
   b. Rockwood (RO).
   c. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
   1. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
   2. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

3. Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood (RO).
   c. Trimco (TC).

2.5 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.

B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.

C. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
   1. Threaded mortise cylinders with rings and cams to suit hardware application.
   2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
   4. Tubular deadlocks and other auxiliary locks.
   5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.

D. Removable Cores: Provide removable cores as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.

E. Keying System: Each type of lock and cylinders to be factory keyed.
   1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
   2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
   3. New System: Key locks to a new key system as directed by the Owner.
F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Master Keys (per Master Key Level/Group): Five (5).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:
   a. Lund Equipment (LU).
   b. MMF Industries (MM).
   c. Telkee (TK).

2.7 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.

1. Where specified, provide status indicators with highly reflective color and wording for “locked/unlocked” or “vacant/occupied” with custom wording options if required. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status. Indicator window size to be a minimum of 2.1” x 0.6” with a curved design allowing a 180 degree viewing angle with protective covering to prevent tampering.

2. Manufacturers:
   a. Corbin Russwin Hardware (RU) - ML2000 Series.
   b. Sargent Manufacturing (SA) - 8200 Series.
   c. Schlage (SC) - L9000 Series.
B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed.

1. Vertical Impact: Exceed 100 vertical impacts (20 times ANSI/BHMA A156.2 requirements).

2. Furnish with solid cast levers, standard 2 3/4” backset, and 1/2” (3/4” at rated paired openings) throw brass or stainless steel latchbolt.

3. Locks are to be non-handed and fully field reversible.

4. Manufacturers:
   a. Corbin Russwin Hardware (RU) - CLX3300 Series.
   b. Sargent Manufacturing (SA) - 10X Line.
   c. Schlage (SC) - ND Series.

2.8 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.9 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes tested to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.
1. Manufacturers:
   a. HES (HS) - 1500/1600 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.10 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.

2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.

4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.

5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
   a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
   b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

6. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.

7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.


9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

1. Manufacturers:
   a. Corbin Russwin Hardware (RU) - ED4000 / ED5000 Series.
   b. Sargent Manufacturing (SA) - 80 Series.
   c. dormakaba Precision (PR) - Apex 2000 Series.

2.11 ELECTROMECHANICAL EXIT DEVICES

A. Electromechanical Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed panic and fire exit hardware devices subject to same compliance standards and requirements as mechanical exit devices. Electrified exit devices to be of type and design as specified below and in the hardware sets.

1. Energy Efficient Design: Provide devices which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.

2. Where conventional power supplies are not sufficient, include any specific controllers required to provide the proper inrush current.

3. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.

4. Manufacturers:
   a. Corbin Russwin Hardware (RU) - ED5000 Series.
   b. dormakaba Precision (PR) - Apex 2000 Series.
   c. Sargent Manufacturing (SA) - 80 Series.

2.12 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Manufacturers:
   a. Corbin Russwin Hardware (RU) - DC6000 Series.
   b. Norton Rixson (NO) - 7500 Series.
   c. Sargent Manufacturing (SA) - 351 Series.

2.13 ELECTROHYDRAULIC DOOR OPERATORS

A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.

1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

B. Standard: Certified ANSI/BHMA A156.19.

C. Performance Requirements:

1. Opening Force if Power Fails: Not more than 15 lbf required to release a latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.

2. Entrapment Protection: Not more than 15 lbf required to prevent stopped door from closing or opening.
D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.

E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.

F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.

G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.

H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.

I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Norton Rixson (NO) - 6000 Series.

2.14 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
   a. Hiawatha, Inc. (HI).
   b. Rockwood (RO).
   c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
2.15 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
   1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:
   1. National Guard Products (NG).
   2. Pemko (PE).

2.16 ELECTRONIC ACCESSORIES

A. Request-to-Exit Motion Sensor: Request-to-Exit Sensors motion detectors specifically designed for detecting exiting through a door from the secure area to a non-secure area. Include built-in timers (up to 60 second adjustable timing), door monitor with sounder alert, internal vertical pointability coverage, 12VDC or 24VDC power and selectable relay trigger with fail safe/fail secure modes.
   1. Manufacturers:
      a. Securitron (SU) - XMS Series.
B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1” diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:
   a. Securitron (SU) - DPS Series.

C. Intelligent Switching Power Supplies: Provide power supplies with single, dual or multi-voltage configurations at 12 and/or 24VDC. Power Supply shall have battery backup function with an integrated battery charging circuit. The power supply shall have a standard, integrated Fire Alarm Interface (FAI). The power supply shall provide capability for secondary voltage, power distribution, direct lock control and network monitoring through add on modules. The power supply shall be expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs. Network modules shall provide remote monitoring functions such as status reporting, fault reporting and information logging.

1. Manufacturers:
   a. Securitron (SU) - AQL Series.

2.17 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.18 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.


3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.


3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with
corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. OT - Other
4. SU - Securitron
5. RO - Rockwood
6. RU - Corbin Russwin
7. AT - Accurate Lock and Hardware
8. SA - SARGENT
9. HS - HES
10. RF - Rixson
11. NO - Norton

| Hardware Sets |
| Set: 1.0 |

Doors: 122.1

| 1 Continuous Hinge | FM__HD1 | C PE |
| 1 Rim Exit Device, Dummy | ED5200 N950ET M52 CT6B | 630 RU |
| 1 Permanent Core | CR8000 | 626 RU |
| 1 Conc Overhead Stop | 1-X36 | 630 RF |
| 1 Surface Closer | DC6200 / DC6210 | 689 RU |
| 1 Kick Plate | K1050 8" high CFC BEV | US32D RO |
| 1 Threshold | 158A MSES10SS | PE |
1 Gasketing 290APK x 2891APK PE
1 Sweep 18061CNB PE
1 Position Switch DPS-M-BK SU

Set: 2.0

Doors: 114B.3, 115A.3

1 Continuous Hinge FM__HD1 C PE
1 Rim Exit Device, Classroom ED5202 N955ET CT6B X CR3300-138 Inside Cylinder 630 RU
1 Permanent Core CR8000 626 RU
1 Conc Overhead Hold Open 1-X26 630 RF
1 Surface Closer DC6200 / DC6210 689 RU
1 Kick Plate K1050 8" high CFC BEV US32D RO
1 Threshold 158A MSES10SS PE
1 Gasketing 290APK x 2891APK PE
1 Sweep 18061CNB PE
1 Position Switch DPS-M-BK SU

Notes: Door closed & locked at all times. Operation of door from either side activate door contact.

Set: 3.0

Doors: 100.1

6 Hinge, Full Mortise, Hvy Wt T4A3386 US32D MK
1 Mullion CR907BKM CT6B RU
2 Rim Exit Device, Dummy ED5200 N950ET M52 CT6B 630 RU
5 Permanent Core CR8000 626 RU
2 Electric Strike 9600 630 HS
1 Surface Closer DC6210 A11 689 RU
1 Door Operator Existing to Reused OT
2 Wireless Paddle Compatible with Existing Operator OT
2 Kick Plate K1050 8" high CFC BEV US32D RO
1 Threshold 179AV MSES10SS PE
1 Gasketing 290APK x 2891APK PE
2 Sweep 18061CNB PE
2 Astragal 18041CNB PE
1 Wiring Diagram WD-SYSPK
2 Position Switch DPS-M-BK SU
1 Power Supply  

**AQL Series (Amps & Relays as Required)**

Notes: Existing operator to be modified as required to accept new wireless paddles.

Coordinate hinge size with existing frame cutouts.

Electrical contractor to coordinate wiring for electric strikes mounted to removable mullion.

Door closed & locked at all times. Operating inside operator paddle activates shunts door contact and allowing authorized egress at all times. With loss of power door remains locked.

**Set: 4.0**

Doors: 109C.1

1 Continuous Hinge  

FM__HD1  

C  

PE

1 Storeroom Lock  

CLX3357 NZD CT6B  

626  

RU

1 Permanent Core  

CR8000  

626  

RU

1 Electric Strike  

1600-CLB  

BSP  

HS

1 Conc Overhead Stop  

1-X36  

630  

RF

1 Surface Closer  

DC6200 / DC6210  

689  

RU

1 Threshold  

158A MSES10SS  

PE

1 Gasketing  

290APK x 2891APK  

PE

1 Sweep  

18061CNB  

PE

1 ElectroLynx Harness - Frame  

QC-C1500P  

MK

1 Card Reader  

By Security System Supplier  

OT

1 Position Switch  

DPS-M-BK  

SU

1 REX Sensor  

By Security System Supplier  

OT

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Inside activating request to exit switch shunts door contact and allowing authorized egress at all times. With loss of power door remains locked.

**Set: 5.0**

Doors: 104.2

1 Continuous Hinge  

FM__HD1  

C  

PE

1 Storeroom Lock  

CLX3357 NZD CT6B  

626  

RU

1 Permanent Core  

CR8000  

626  

RU
1 Electric Strike 1600-CLB  BSP  HS
1 Automatic Opener 6061 / 6071  689  NO
1 Kick Plate K1050 8” high CFC BEV  US32D  RO
1 Threshold 158A MSES10SS  PE
1 Gasketing 290APK x 2891APK  PE
1 Sweep 18061CNB  PE
1 ElectroLynx Harness - Frame QC-C1500P  MK
1 Card Reader By Security System Supplier  OT
1 Wiring Diagram WD-SYSPK
1 Position Switch DPS-M-BK  SU
2 Wall Switch 700  NO
1 REX Sensor By Security System Supplier  OT

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches, activates outside operator paddle & allows for authorized entrance. Operating inside operator paddle or activating request to exit switch shunts door contact and allows authorized egress at all times. With loss of power door remains locked.

Set: 6.0

Doors: 101.1

2 Continuous Hinge FM__HD1  C  PE
1 Mullion CR907BKM CT6B  RU
2 Rim Exit Device, Storeroom ED5200 N959ET M52 CT6B  630  RU
3 Permanent Core CR8000  626  RU
2 Electric Strike 9600  630  HS
1 Surface Closer DC6210 A11  689  RU
1 Door Operator Existing to be Reused  OT
2 Wireless Paddle Compatible with Existing Operator  OT
1 Card Reader By Security System Supplier  OT
1 Wiring Diagram WD-SYSPK
2 Position Switch DPS-M-BK  SU
1 REX Sensor By Security System Supplier  OT
1 Power Supply AQL Series (Amps & Relays as Required)  SU

Notes: Existing operator to be modified as required to accept new wireless paddles.

Electrical contractor to coordinate wiring for electric strikes mounted to removable mullion.
Door closed & locked at all times. Presenting valid credential outside shunts door position switches, activates outside operator paddle & allows for authorized entrance. Operating inside touchpad or inside operator paddle activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

**Set: 7.0**
Doors: 114B.1, 114B.2, 115A.1, 115A.2

3 Hinge, Full Mortise: TA2714
1 Rim Exit Device, Classroom: ED5200 N955ET CT6B
1 Permanent Core: CR8000
1 Surface Closer: DC6200 / DC6210
1 Door Stop: RM850 / RM860
3 Silencer: 608

**Set: 8.0**
Doors: 114C.1

3 Hinge, Full Mortise: TA2714
1 Storeroom Lock: CLX3357 NZD CT6B
1 Permanent Core: CR8000
1 Door Stop: RM850 / RM860
3 Silencer: 608

**Set: 9.0**
Doors: 109B.1

3 Hinge, Full Mortise: TA2714
1 Storeroom Lock: CLX3357 NZD CT6B
1 Permanent Core: CR8000
1 Concealed Overhead Stop: 2-X36
3 Silencer: 608

**Set: 10.0**
Doors: 110.1

3 Hinge, Full Mortise: TA2714
1 Storeroom Lock: CLX3357 NZD CT6B
1 Permanent Core: CR8000
1 Surface Closer       DC6200 / DC6210       689       RU
1 Door Stop           RM850 / RM860       US26D       RO
1 Gasketing           S773BL               PE

Set: 11.0
Doors: 105.1, 107.1, 108.1, 112.1

3 Hinge, Full Mortise   TA2714               US26D       MK
1 Entrance Lock        CL3351 NZD CT6B       626       RU
1 Permanent Core       CR8000               626       RU
1 Surface Closer       DC6200 / DC6210       689       RU
1 Door Stop           RM850 / RM860       US26D       RO
1 Gasketing           S773BL               PE

Set: 12.0
Doors: 115B.1, 115B.2, 118A.1, 119A.1, 120.1

6 Hinge, Full Mortise   TA2714               US26D       MK
1 Dust Proof Strike    570                   US26D       RO
1 Flush Bolt          555                   US26D       RO
1 Classroom Lock       CLX3355 NZD CT6B       626       RU
1 Permanent Core       CR8000               626       RU
2 Concealed Overhead Stop 2-X36        630       RF
2 Silencer            608                   RO

Set: 13.0
Doors: 109.1

3 Hinge, Full Mortise   TA2714               US26D       MK
1 Classroom Lock       CLX3355 NZD CT6B       626       RU
1 Permanent Core       CR8000               626       RU
1 Surface Closer       DC6200 / DC6210       689       RU
1 Door Stop           RM850 / RM860       US26D       RO
1 Gasketing           S773BL               PE

Set: 14.0
Doors: 114A.1

3 Hinge, Full Mortise   TA2714               US26D       MK
1 Passage Latch w/Indicator   ML2040 NSA V21    626       RU
1 Door Stop 400 / 441H US26D RO
1 Gasketing S773BL PE

Set: 15.0

Doors: 104.1

3 Hinge, Full Mortise TA2714 US26D MK
1 Entrance Lock CL3351 NZD CT6B 626 RU
1 Permanent Core CR8000 626 RU
1 Door Stop RM850 / RM860 US26D RO
3 Silencer 608 RO

Set: 16.0

Doors: 114.1, 115.1, 118.1, 119.1

3 Hinge, Full Mortise TA2714 US26D MK
1 Entrance Lock CLX3361 NZD CT6B 626 RU
1 Permanent Core CR8000 626 RU
1 Conc Overhead Stop 1-X36 630 RF
1 Gasketing S773BL PE

Set: 17.0

Doors: 106.1, 111.1, 113.1

3 Hinge, Full Mortise TA2714 US26D MK
1 Privacy Lock CLX3320 NZD 626 RU
1 Surface Closer DC6200 / DC6210 689 RU
1 Door Stop RM850 / RM860 US26D RO
1 Gasketing S773BL PE

Set: 18.0

Doors: 116.1, 117.1

3 Hinge, Full Mortise TA2714 US26D MK
1 Classroom Lock CLX3355 NZD CT6B 626 RU
1 Permanent Core CR8000 626 RU
1 Conc Overhead Stop 1-X36 630 RF
3 Silencer 608 RO

Set: 19.0

UMF – ECEC 087100-26 Door Hardware
Doors: 116A.1, 117A.1

1 Pocket Door Framing Kit | Hafele - SLIDO | OT
1 Pocket Door Hardware System | Hafele D-Line (Compatible with SLIDO Framing Kit) | OT
1 Door Pull | 111BTB5 | US32D  RO

Set: 20.0

Doors: E103.1, E103A.1

3 Hinge, Full Mortise | TA2714 | US26D  MK
1 Storeroom Lock | CLX3357 NZD CT6B | 626  RU
1 Permanent Core | CR8000 | 626  RU
1 Surface Closer | DC6200 / DC6210 | 689  RU
1 Door Stop | 400 / 441H | US26D  RO
3 Silencer | 608 | RO

Notes: GC to confirm existing opening will accept new hardware prior to releasing any material for fabrication.

END OF SECTION 087100
### Door Hardware

<table>
<thead>
<tr>
<th>Item</th>
<th>Model/Code</th>
<th>Finish</th>
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<td>3 Hinge, Full Mortise</td>
<td>TA2714</td>
<td>US26D</td>
</tr>
<tr>
<td>1 Storeroom Lock</td>
<td>CLX3357 NZD CT6B</td>
<td>626</td>
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<tr>
<td>1 Permanent Core</td>
<td>CR8000</td>
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</tr>
<tr>
<td>3 Silencer</td>
<td>608</td>
<td>RO</td>
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</tbody>
</table>

Notes: GC to confirm existing opening will accept new hardware prior to releasing any material for fabrication.

END OF SECTION 087100
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Glass and glazing for the following products and applications:
   a. Aluminum frames and sidelights specified in Section 084110 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
   b. Interior lites.
   c. Security glass units.
   d. One way glazing units.
   e. Unframed mirrors.
   f. Acrylic mirrors.

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions.
Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

   b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
      1) Load Duration: 60 seconds or less.
   c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
      1) For monolithic-glass lites heat-treated to resist wind loads.
      2) For insulating glass.
      3) For laminated-glass lites.
   d. Minimum Glass Thickness for Exterior Lites: Not less than 6 mm.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units with lites 6.0 mm thick and a nominal 1/2-inch-wide interspace.
4. Center-of-Glass Values: Based on using LBL-44789 WINDOW 6.3 computer program for the following methodologies:

   a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: 12-inch-square Samples for each type of glass and glass assembly, glazing sealants.

C. Shop Drawings: Submit shop drawings showing framed acrylic mirror seams.

D. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

F. Qualification Data: For installers.

G. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

H. Product Test Reports: For each type of glazing products:

I. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, laminated glass and insulating glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Elastomeric Glazing Sealant Product Testing: Obtain sealant test results for product test reports in "Submittals" Article from a qualified testing agency based on testing current sealant formulations within a 36-month period.

1. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

2. Test elastomeric glazing sealants for compliance with requirements specified by reference to ASTM C 920, and where applicable, to other standard test methods.
F. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing indicated below, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
2. Submit not fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
5. Testing will not be required if elastomeric glazing sealant manufacturers submit data based on previous testing of current sealant products for adhesion to, and compatibility with, glazing materials matching those submitted.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency] acceptable to authorities having jurisdiction.
2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

H. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.


I. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

J. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup for types of windows indicated, in locations shown on Drawings.

K. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to the Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to the Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATING-GLASS UNITS

A. Insulating-Glass Units for Vertical Glazing: 1 inch thick (25.0 mm) insulating glass consisting of two lites of 1/4 inch (6 mm) glass, low e coating on the No. 2 surface and argon gas filled. Provide one of the following or equal:

1. Guardian Industries; SN-68.

   b. Reflectance Visible Light: 10 percent.
c. U Value (Winter): 0.25.
d. Shading Coefficient: 0.43.
e. Solar Heat Gain Coefficient: 0.38.

2. Viracon; VE1-2M.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.25.
   d. Shading Coefficient: 0.43.
e. Solar Heat Gain Coefficient: 0.37.

3. Vitro Architectural Glass (formerly PPG Industries); Solarban 60.
   a. Visible Light Transmittance: 70 percent.
   b. Reflectance Visible Light: 11 percent.
   c. U Value (Winter): 0.29.
   d. Shading Coefficient: 0.44.
e. Solar Heat Gain Coefficient: 0.38.

B. Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.

2.2 GLASS PRODUCTS

A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
   1. Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.

B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
   2. For uncoated glass, comply with requirements for Condition A.
   3. For coated vision glass, comply with requirements for Condition C (other coated glass).

C. Tempered Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT; 1/4 inch thick unless indicated otherwise.

D. Laminated Glass: ASTM C 1172, and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction for Framed Units: Laminate glass with polyvinyl butyral interlayer to comply with interlayer manufacturer's written recommendations.
   2. Construction for Units with Exposed Edges: Laminate glass with cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written recommendations.
   3. Interlayer Thickness: 0.030 inch (0.76 mm) thick for vertical glazing, 0.060 inch (1.52 mm) thick for sloped glazing.
   4. Interlayer Color: Clear unless otherwise indicated.
E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by an argon-filled interspace, and complying with ASTM E2190 and with requirements specified in this Section.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 “Performance Requirements” paragraph.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit’s edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:
5. Spacer Specifications: Manufacturer’s standard spacer material. Spacer corners shall be bent, soldered, or welded. Keyed spacer corners will not be accepted. Spacer may have a mid-span spacer key located at the midpoint of the insulating glass unit head. Where a mid-span spacer key is used, the key must be fully embedded (all sides) in butyl sealant.

F. Insulated Security Glass Units:

1. Product: SG4 by School Guard Glass as manufactured by Laminated Technologies Inc. (844) 744-5277; Global Security Glazing, Child Guard Glass; or approved equal.
   a. Security glazing shall have the following characteristics:
      1) No more than 3/8” nominal glass lite thickness
      2) No more than 4.16 lbs. per square foot
      3) 5-aa1 rated for a minimum of 6 minutes
      4) Glass clad on interior and exterior surfaces
      5) F1233 rated
      6) Optical Haze of no more than 1.8%
2. Insulated Security Glass Unit Assemblies:
   a. Insulating Glass Units for Vertical Glazing: Type (SG4):
      1) Overall thickness: 1” inch thick insulating glass
      2) Outerlite: 1/4” tempered glass, low e coating on the No. 2 surface.
      3) Airspace: 3/8” thick argon gas filled space, and mill finish warm edge air spacer.
      4) Innerlite: SG4 with low-e coating on the No. 2 surface and no. 5 (for triple glazed).

G. One Way Security Glazing Units:

1. Innerlite: 1/4” laminated glass.
2. Outerlite: One way mirrored glass, Pilkington Mirropane or equal.

H. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.
1. Mirror Edge Treatment: Flat polished edge.

I. Acrylic Mirrors: Provide products by Plaskolite.

2.3 GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, interlayer of laminated glass, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers’ written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer’s full range.


5. VOC Content:
   a. Structural Glazing Adhesives: 100 g/L.
   b. Architectural Sealants: 250 g/L.

6. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
   a. Dow Corning Corporation; 790.
   b. GE Silicones; SilPruf LM SCS2700.
   c. Tremco Inc.; Spectrem 1.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.
2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

   2. VOC Content: 250 g/L or less.
   3. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.
   4. Do not use adhesives that contain urea formaldehyde.

G. Mirror Hardware, Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

2.7 ACCESSORIES

A. Provide Total Security Solutions; MK3 transaction speaker or comparable product as approved by Architect.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and 
      offsets at corners.
   2. Presence and functioning of weep system.
   3. Minimum required face or edge clearances.
   4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. 
   Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and 
   other glazing materials, unless more stringent requirements are indicated, including those in 
   referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, 
   minimum edge and face clearances, and adequate sealant thicknesses, with reasonable 
   tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass 
   from Project site and legally dispose of off Project site. Damaged glass is glass with edge 
   damage or other imperfections that, when installed, could weaken glass and impair 
   performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by 
   preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing 
   publications, unless otherwise required by glass manufacturer. Set blocks in thin course of 
   compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. 
      Install correct size and spacing to preserve required face clearances, unless gaskets and 
      glazing tapes are used that have demonstrated ability to maintain required face 
      clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant 
      width. With glazing tape, use thickness slightly less than final compressed thickness of 
      tape.
H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

K. Acrylic Mirrors: Install mirrors mounted on plywood according to manufacturer's written instructions.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do
come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION
SECTION 09 21 10

GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Interior gypsum wallboard.
2. Tile backing panels.
3. Acoustic insulation (sound attenuation batts) in gypsum wallboard assemblies.
4. Non-load-bearing steel framing, including angles in partial-height partitions.
5. Installation of access panels.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 054000 - COLD-FORMED METAL FRAMING for load-bearing steel framing.
2. Section 061000 - ROUGH CARPENTRY for plywood backing panels.
3. Section 083110 - ACCESS DOORS AND FRAMES for furnishing access doors and frames in gypsum board assemblies.
4. Section 093000 - TILING for joint compound at cementitious tile backing panels.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.

1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
2. Provide metal framing engineered to meet code requirements, project requirements, required heights, and the following deflection criteria. For gypsum board assemblies without applied rigid finishes L/240; for gypsum board assemblies with applied rigid finishes such as tile, stone, wood paneling L/360. Lateral load 5 psf except at shafts. Lateral load at shafts shall be required based on analysis of equipment and systems using shafts.
3. Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.

B. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
2. Locate within 15 feet of end of each wall and repeat at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
3. Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in contrasting color, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," or other wording.
4. Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

1.4 SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: If materials and systems other than those specified and those indicated on the Drawings are proposed for use, submit shop drawings signed and sealed by a structural engineer licensed in the jurisdiction of the project certifying proposed systems meet code and project requirements.
   1. Verify correct length for long spans.
C. Samples: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE
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.

1.6 STORAGE AND HANDLING
A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS
A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
B. Do not install interior products until installation areas are enclosed and conditioned.
C. Do not install panels that are wet, those that are moisture damaged, and those that are 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 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   2. Protective Coating: Manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.
   3. Recycled Content: Use minimum recycled content of 25%.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch-diameter wire, or double strand of 0.0475-inch-diameter wire.

B. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      a. Type: Postinstalled, expansion anchor.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges with depth as required for span and loading and indicated on Drawings.

E. Furring Channels (Furring Members): 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.

F. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      b. Chicago Metallic Corporation; Drywall Furring System.
      c. USG Corporation; Drywall Suspension System.
   2. Performance Requirements: Ceiling support system shall support a live load of 6 psf minimum at L/240.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. EB Metal U.S.
3. Marino\WARE.

B. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base-Steel (Uncoated) Thickness: 0.0296 inches (20 gage).
   2. Minimum Base-Steel (Uncoated) Thickness: 0.0269 inches (22 gage) (0.0190 to 0.0220 inches for embossed steel members depending on width).
   3. Minimum Base-Steel (Uncoated) Thickness: 0.0179 inches (25 gage) (0.0147 to 0.0155 inches for embossed steel members depending on width).
   4. Dimpled studs meeting performance values for equivalent standard studs are acceptable.

C. Partial Wall Framing Connection: 1/2-inch ASTM A36/A36M steel-plate ST50H stud connector designed to support out-of-plane loading of cantilevered partial wall systems that are unsupported at the top track.
   1. Basis-of-Design: Subject to compliance with requirements, provide ClarkDietrich; Pony Wall or equal.

D. Slip-Type Head Joints: Where indicated, provide one of the following:
   1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
   2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
   3. Deflection Track / Deflection Clip: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
         1) Brady Innovations; Sliptrack Systems.
         2) California Expanded Metals Co. (CEMCO); CST Slotted Tracks.
         3) Clark Dietrich Building Systems; MaxTrak Slotted Deflection Track.
         4) Steel Network Inc. (The); VertiTrack VT Series.

E. Fire Stop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. California Expanded Metals Co. (CEMCO); FAS-TRK 1000 Slotted Tracks.
      b. Clark Dietrich Building Systems; BlazeFrame Fire Stop Deflection Track.
      c. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
      d. GCPAT; FlameSafe FlowTrack System.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).

G. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: 1-1/2 inches.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.0312 inch (20 gauge).
   2. Depth: 1-1/2 inches.

I. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission. Strictly comply with manufacturer's installation instruction.

J. Resilient Sound Isolation Clips: Provide galvanized steel and resilient material sound-isolation clips, equal to the following:
   1. Kinetics Noise Control Co.; IsoMax.
   2. PAC International, Inc.; RSIC-1.
   4. Studco Building Systems; ResilMount A237R.

K. Spring Isolation Hangers: Provide galvanized and coated spring hanger system, equal to the following:

L. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches wall attachment flange of 7/8 inch, minimum bare-metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.

M. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

N. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.4 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. CertainTeed Gypsum, Inc.
   2. Georgia-Pacific (G-P) Gypsum.
   4. United States Gypsum Company (USG).

B. Gypsum Wallboard: ASTM C 1396.
   1. Thickness: 1/2 inch and 5/8 inch as indicated.
2. Long Edges: Tapered.
3. Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.

C. Gypsum Wallboard, Fire-Resistant Type X: ASTM C 1396.
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.
   3. Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.
   4. Building Product Disclosure and Optimization, Material Ingredients: Health Product Declaration (HPD) or Declare product labels.

D. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396. With moisture- and mold-resistant core and paper surfaces.
   1. Core: 5/8 inch, Type X.
   2. Long Edges: Tapered.
   3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
   4. Building Product Disclosure and Optimization, Environmental Product Declarations (EPD): Type III EPD.

E. Abuse-Resistant Gypsum Panels: ASTM C 1629. Manufactured to produce greater resistance to surface indentation and through-penetration (impact resistance) than standard, regular-type and Type X gypsum board; 5/8 inch, Type X, long edges tapered.

F. Impact-Resistant Gypsum Wallboard, Level 2: Sheetrock Brand Mold Tough VHI Firecode X by USG, ToughRock Fireguard X Mold-Guard Abuse-Resistant Gypsum Board by Georgia-Pacific, or Gold Bond Hi-Impact XP Gypsum Board by National Gypsum.

2.5 TILE BACKING PANELS

A. Cementitious Tile Backing Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.
   1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
      a. Custom Building Products; Wonderboard and Wonderboard Lite.
      b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
      c. National Gypsum Company; Permabase Cement Board.
      d. USG Corporation; DUROCK Cement Board.
   2. Thickness: 5/8 inch.
   3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc, with flanges for mechanical fastening, unless otherwise indicated.

2. Shapes:
   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. Expansion (control) joint. For control joints in fire rated walls provide Cemco FAS 093X fire-rated control joint or equal.
   e. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.
   5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

D. Joint Compound for Tile Backing Panels:
   1. Cementitious Backing Units: Thinset, nonsag mortar, as recommended by backing unit manufacturer. Refer to Section 093000 - TILING.
   2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   2. VOC Content: 50 g/L or less.
   3. Methylene chloride and perchloroethylene may not be intentionally added to adhesives.
   4. Do not use adhesives that contain urea formaldehyde.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious tile backing units, use screws of type and size recommended by panel manufacturer.
   3. For fastening abuse-resistant gypsum panels, use Type S 'high-low' screws.
   4. For fastening impact-resistant gypsum panels, use Type S 'high-low' screws.

D. Acoustic Insulation, Sound Attenuation (Batts) 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. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. CertainTeed Corporation; NoiseReducer.
      c. Knauf Insulation; EcoBatt.
      d. Owens Corning; EcoTouch SAB.
      e. Owens Corning; Thermafiber SAFB FF.
      f. Rockwool (formerly Roxul); AFB evo.
   4. Recycled Content: Use minimum recycled content of 25%.
   5. Building Product Disclosure and Optimization, Material Ingredients: Health Product Declaration (HPD) or Declare product labels.

E. Acoustical Sealant: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, joint sealant, recommended for sealing interior concealed joints to reduce airborne sound transmission.
   1. Available Products, for Concealed and Exposed Joints: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
c. USG; SHEETROCK Acoustical Sealant.

2. Available Products, for Concealed Joints Only: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. OSI (a division of Henkel); Pro-Series SC-175.
   b. Pecora Corp.; BA-98.
   c. Tremco, Inc.; Tremco Acoustical/Curtainwall Sealant.


4. VOC Content, Architectural Sealants: 250 g/L or less.

5. Methylene chloride and perchloroethylene may not be intentionally added to sealants.

2.9 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

A. Identification Labels: Self-adhesive signs, to comply with applicable local Code.

   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. Fire Wall Signs, Inc.
      b. Marking & Identification Tape (mnitape.com).
      c. My Safety Sign.
      d. Safety Supply Warehouse.

   2. Text: "FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

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 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.

5. Do not attach hangers to steel roof deck.

6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb, unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

6. Curved Partitions:
   a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
   b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Direct Furring: Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
E. Z-Furring Members:
1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

3.6 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. Form control and expansion joints with space between edges of adjoining gypsum panels.
F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.7 APPLYING INTERIOR GYPSUM BOARD
A. 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 to minimize end joints.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.

4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.

2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.8 APPLYING TILE BACKING PANELS

A. Cementitious Tile Backing Units: ANSI A108.1, at locations indicated to receive tile, with joints treated to comply with ANSI A108.11.

B. Water-Resistant Backing Board: Install at areas not subject to wetting and elsewhere as indicated with 1/4-inch gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.9 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners, unless otherwise indicated.
   2. LC-Bead: Use at exposed panel edges.
   3. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim: Install in locations indicated on Drawings.

3.10 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Comply with GA-214. Finish panels to levels indicated below:
   1. Level 1: Ceiling plenum areas and concealed areas not exposed to view.
   2. Level 2: Panels that are substrate for tile.
   4. Level 4: Panel surfaces that will be exposed to view (typical panels).
   5. Level 5: Where indicated on Drawings; includes areas to receive dry erase coatings, wall graphics, and wallcoverings.

E. Cementitious Tile Backing Units: Finish according to manufacturer's written instructions.

3.11 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.12 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.
   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 51 00
ACoustical Ceilings

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within
DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of
the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this
Section, including but not limited to the following:

1. Acoustical ceiling tiles and panels.
2. Suspension systems, grid systems and ceiling hangers.
3. Acoustical sealant at edge moldings at acoustical ceilings.

B. Related Work: The following items are not included in this Section and are specified under the
designated Sections:

1. Section 092110 - Gypsum Board Assemblies for gypsum board ceilings and soffits.
2. Division 21 - Fire Suppression for fire-suppression components located in ceilings.
3. Division 23 - Heating, Ventilating and Air Conditioning for air handling and
distribution components located in ceilings.
4. Division 26 - Electrical for light fixture and alarm system components located in
ceilings.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations
and ceiling-mounted items. Show the following:

1. Ceiling suspension members.
2. Method of attaching hangers to building structure. Furnish layouts for cast-in-place
anchors, clips, and other ceiling attachment devices whose installation is specified in
other Sections.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers,
access panels, and special moldings.

C. Samples for Verification: For each component indicated and for each exposed finish required,
prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long
Samples of each type, finish, and color.
D. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.

E. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations:

1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.
2. Suspension Systems: Obtain each type through one source from a single manufacturer.
3. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
3. Identify materials with appropriate markings of applicable testing and inspecting agency.
4. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.

C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete,
and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 BASIS-OF-DESIGN

A. Basis-of-Design Products: Refer to the Finish Schedule on the Drawings.

2.2 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong Ceilings.
2. CertainTeed Ceilings.
3. USG.

2.3 METAL SUSPENSION SYSTEMS

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
3. Face Design: Flat, flush.
6. Grid Face Width: As specified with ACT type.
7. Recycled Content: Use minimum recycled content of 25%.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

1. Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.

a. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

   a. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, “Direct Hung”) will be less than yield stress of wire, but provide not less than 0.106 diameter wire.

D. Hold-Down Clips: At vestibules and areas subject to wind uplift, provide manufacturer's standard hold-down clips spaced 24 inches on all cross tees.

2.4 METAL EDGE MOLDINGS AND TRIM

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

B. Suspension Trim: Subject to compliance with requirements, provide one of the following:

2. CertainTeed Ceilings; Approved equal.
3. USG Interiors, Inc.; Compasso.

2.5 ACOUSTICAL SEALANT

A. Acoustical Sealant, for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, joint sealant, recommended for sealing interior concealed joints to reduce airborne sound transmission.

1. Available Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. OSI (a division of Henkel); Pro-Series SC-175.
   b. Pecora Corp.; AC-20 FTR Acoustical and Insulation Sealant.
   c. Pecora Corp.; BA-98.
   d. Specified Technologies, Inc. (STI); Smoke N Sound Acoustical Sealant.
   e. USG; SHEETROCK Acoustical Sealant.


3. VOC Content, Architectural Sealants: 250 g/L or less.
4. Methylene chloride and perchloroethylene may not be intentionally added to sealants.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

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

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Resilient flooring.
2. Resilient wall base and accessories.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 096800 - CARPETING for carpet accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Wet Dynamic Coefficient of Friction: For flooring exposed as a walking surface, provide products with the following values as determined by testing identical products per ANSI/ NFSI B101.3 - 2012 Test Method for Measuring Wet DCOF of Common Hard-Surface Floor Materials, or ANSI 326.3 - American National Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Materials - 2017. Testing by other methods or earlier editions of the specified test method is not acceptable.

1. Wet Dynamic Coefficient of Friction: Not less than 0.43.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each type of floor covering. Include floor covering layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples for Verification: Full-size units of each color and pattern of resilient flooring required.

1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
2. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
D. Maintenance Data: For resilient products to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.7 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

1.8 EXTRA MATERIALS (ATTIC STOCK)

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.

B. Resilient Flooring: Full-width tiles equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PRODUCTS

1.9 BASIS-OF-DESIGN

A. Basis-of-Design Products: Refer to the Finish Schedule on the Drawings.

1.10 LUXURY VINYL PLANK FLOOR COVERING

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Armstrong World Industries, Inc.
2. Congoleum Corporation.
3.  Mannington Mills, Inc.
4.  Tarkett, Inc.

1.11 RESILIENT WALL BASE

A.  Manufacturers:  Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1.  American Biltrite Flooring; AB Pure.
2.  Johnsonite, a division of Tarkett.

B.  Resilient Wall Base: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous). Do not use polyvinyl chloride (PVC).

1.  Shape:  Straight (toeless) at carpet and coved at concrete and resilient flooring.
2.  Minimum Thickness:  0.125 inch.
3.  Height: 4 inches.
4.  Lengths:  Cut lengths 48 inches long or coils in manufacturer's standard length.
5.  Outside Corners:  Premolded.
7.  Surface:  Smooth.
8.  Style and Colors:  As indicated on the Finish Schedule.
9.  Material Ingredients:  Cradle to Cradle (C2C) certification or Declare product label. PVC, phthalate-, chlorine-, and halogen-free.

1.12 RESILIENT MOLDING ACCESSORY

A.  Manufacturers:  Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1.  American Biltrite Flooring; AB Pure.
2.  Johnsonite, a division of Tarkett.

B.  Types Include the Following as Applicable:  Cap for cove carpet, carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, joiner for tile and carpet.

1.  Material:  Rubber.
2.  Profile and Dimensions:  As indicated.

1.13 INSTALLATION MATERIALS

A.  Trowelable Leveling and Patching Compounds:  Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

1.  Available Products:  Mapei; Mapecem Premix.

B.  Adhesives:  Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
   a. VOC Content: 50 g/L or less.
   b. Methylene chloride and perchloroethylene may not be intentionally added to adhesives. Do not use adhesives that contain urea formaldehyde.

2. Adhesives, for Wall Base:
   a. Available Products: Subject to compliance with requirements, provide one of the following products:
      1) Forbo; L910W Wall Adhesive.
      2) Johnsonite; 960 Cove Base Adhesive.

C. Seamless-Installation Accessories:
      a. Color: Match floor covering.

D. Integral-Flash-Cove-Base Accessories:
   1. Cove Strip: 1-inch radius provided or approved by manufacturer.
   2. Cap Strip: Provided or approved by manufacturer.

E. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

2.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within a range on pH scale not
less than 5 or more than 9 pH, or as otherwise required in writing by manufacturer of flooring.

3. Moisture Vapor Emission Testing:
   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, or as otherwise required in writing by manufacturer of flooring.

4. Relative Humidity Testing:
   a. Perform relative humidity test, ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level of 75 percent, or as otherwise required in writing by manufacturer of flooring.

5. Perform tests indicated above and as recommended by flooring manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
   1. Slope floor where indicated on Drawings.

E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
   1. Do not install resilient products until they are same temperature as space where they are to be installed.

F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

2.3 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles in pattern indicated.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, doorframes, thresholds, and nosings.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

2.4 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

2.5 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

2.6 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

   a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

   1. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
2. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION
SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Carpet tile.
2. Carpet accessories.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 096510 - RESILIENT FLOORING AND ACCESSORIES for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
2. Existing flooring materials to be removed.
3. Existing flooring materials to remain.
4. Carpet type, color, and dye lot.
5. Seam locations, types, and methods.
6. Type of subfloor.
7. Type of installation.
8. Pattern type, repeat size, location, direction, and starting point.
10. Type, color, and location of insets and borders.
11. Type, color, and location of edge, transition, and other accessory strips.
12. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch-long Samples.
D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

E. Sample Warranties: For special warranties.

F. Maintenance Data: For carpet to include in maintenance manuals specified in Division 01. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.4 QUALITY ASSURANCE


B. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

C. Mockups: Before installing carpet, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI Carpet Installation Standard, Section 5, "Storage and Handling."

B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.

1.6 PROJECT CONDITIONS

A. General: Comply with CRI Carpet Installation Standard, Section 7, "Site Conditions."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

D. Where demountable partitions, equipment, or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Carpet Warranty: Written warranty, signed by carpet manufacturer agreeing to replace carpet that does not comply with requirements or that fails within specified warranty period.
Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, and delamination.

1. Warranty Period: Ten years from date of Substantial Completion.

1.8 EXTRA MATERIALS (ATTIC STOCK)

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. Carpet: Full-width rolls and tiles equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ege Carpets.
2. InterfaceFLOR.
6. Shaw, a Berkshire Hathaway Co.
7. Tandus Centiva, a Tarkett Company.

2.2 CARPET

A. Carpet Products: Subject to compliance with requirements, provide one of the following:

1. Carpet Types (CPT-#): Refer to Finish Schedule.

2.3 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by carpet manufacturer.

C. Adhesive Film, for Carpet Tiles: Pressure sensitive adhesive, applied on one side of a polyester film, recommended by carpet tile manufacturer for releasable installation.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. InterfaceFLOR; TacTiles.
   b. Shaw; LokDots Adhesive.
   c. Tandus Centiva; TandusTape+
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Examine carpet for type, color, pattern, and potential defects.

C. Concrete Subfloors: Comply with CRI Carpet Installation Standard, Section 9, “Testing Concrete Substrates.” Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the carpet manufacturer.
   2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

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

3.2 PREPARATION

A. General: Comply with CRI Carpet Installation Standard, Section 7.3, “Site Conditions; Floor Preparation,” and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Alkalinity and Adhesion Testing: Perform tests recommended by flooring manufacturer. Proceed with installation only after substrate alkalinity falls within a range on pH scale not less than 5 or more than 9 pH, or as otherwise required in writing by manufacturer of flooring.
   3. Moisture Vapor Emission Testing:
      a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours, or as otherwise required in writing by manufacturer of flooring.
   4. Relative Humidity Testing:
      a. Perform relative humidity test, ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level of 75 percent, or as otherwise required in writing by manufacturer of flooring.
   5. Perform tests indicated above and as recommended by flooring manufacturer. Proceed with installation only after substrates pass testing.

C. Use trowelable leveling and patching compounds, according to manufacturer’s written instructions, to fill cracks, holes, and depressions in substrates.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. 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. Carpet Tile:** Comply with CRI Carpet Installation Standard, Section 18, "Modular Carpet," and with carpet tile manufacturer's written installation instructions.

1. Installation Method, for Adhesive: Partial glue down; install periodic tiles with releasable, pressure-sensitive adhesive.
2. Installation Method, for Adhesive Film: Free lay; apply adhesive film squares at corners of tiles.
   - a. Do not install tiles with adhesive film at stair and ramp locations.
   - b. Do not install tiles with adhesive film over existing carpets.
   - a. Do not install tiles without adhesive at stair and ramp locations.
   - b. Do not install tiles without adhesive over existing carpets.
5. Maintain dye lot integrity. Do not mix dye lots in same area.

**B. Install pattern parallel to walls and borders.**

**C. Do not bridge building expansion joints with carpet.**

**D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.**

**E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.**

**F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.**

### 3.4 CLEANING AND PROTECTION

**A. Perform the following operations immediately after installing carpet:**

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.

**B. Protect installed carpet to comply with CRI Carpet Installation Standard, Section 20, "Protecting Indoor Installations."**

**C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.**

**END OF SECTION**
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Vinyl wall covering.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 099000 - PAINTING AND COATING for primers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.

B. Shop Drawings: Show location and extent of each wall-covering type. Indicate pattern placement, seams and termination points.

C. Samples for Verification: Full width by 3 ft. long section of wall covering.

1. Sample from same print run or dye lot to be used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of fabric.

D. Product Schedule: For wall coverings. Use same designations indicated on Drawings.

E. Qualification Data: For qualified testing agency.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

G. Maintenance Data: For wall coverings to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Surface-Burning Characteristics: As follows, per ASTM E 84:
1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.

C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

PART 2 - PRODUCTS

2.1 BASIS-OF-DESIGN PRODUCTS

A. Basis-of-Design Products: Refer to the Finish Schedule on the Drawings.

2.2 PERFORMANCE REQUIREMENTS

A. Low-Emitting Materials: Wall covering system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 VINYL WALL COVERING

A. Vinyl Wall-Covering Standards: Provide mildew-resistant products complying with the following:
   1. ASTM F 793 for strippable wall coverings that qualify as Category V, Type II, Commercial Serviceability products.

B. Colors, Textures, and Patterns: As indicated on the Finish Schedule.

2.4 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer.
   1. Adhesive shall have VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Primer/Sealer: Mildew resistant, complying with requirements in Section 099000 - PAINTING AND COATING and recommended in writing by wall-covering manufacturer for intended substrate.

C. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall-covering manufacturer.

D. Seam Tape: As recommended in writing by wall-covering manufacturer.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.

C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
   1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
   2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
   3. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
   4. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

G. Install wall liner, with no gaps or overlaps, where required by wall-covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall-covering installation until wall liner has dried.

3.3 INSTALLATION

A. General: Comply with wall covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.

B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll.

D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
E. Match pattern 6 ft. above the finish floor.

F. Install seams vertical and plumb at least 6 in. from outside corners and 6 in. from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

H. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

B. Use cleaning methods recommended in writing by wall-covering manufacturer.

C. Replace strips that cannot be cleaned.

D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS
A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK
A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Field painting of exposed interior items and surfaces.
   2. Field painting of exposed exterior items and surfaces.
B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
   1. Section 074610 - FIBER-CEMENT SIDING for factory priming siding and trim.
   2. Section 081110 - HOLLOW METAL DOORS AND FRAMES for factory priming steel doors and frames.
   3. Section 081400 - FLUSH WOOD DOORS for factory finishing.
   4. Section 092110 - GYPSUM BOARD ASSEMBLIES for surface preparation of gypsum board.

1.3 DEFINITIONS AND EXTENT
A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
   1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
   2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
   3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
   4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
   1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned,
paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

D. Do NOT paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:
   a. Architectural woodwork.
   b. Acoustical wall panels.
   c. Toilet enclosures.
   d. Metal lockers.
   e. Kitchen appliances.
   f. Elevator entrance doors and frames.
   g. Elevator equipment.
   h. Finished mechanical and electrical equipment.
   i. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
   a. Foundation spaces.
   b. Furred areas.
   c. Ceiling plenums.
   d. Utility tunnels.
   e. Pipe spaces.
   f. Duct shafts.
   g. Elevator shafts.

3. Finished metal surfaces include the following:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper and copper alloys.
   e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:
   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

A. Product Data: For each paint system indicated. Include block fillers and primers.
1. **Material List:** An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

   a. Disclose material ingredients by name and Chemical Abstract Service (CAS) Registry Number.

2. **Manufacturer's Information:** Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

B. **Samples for Verification:** For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

   1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
   2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
   3. Submit two 8 inch by 12 inch Samples for each type of finish coating for Architect's review of color and texture only.

C. **Qualification Data:** For Applicator.

1.5 **QUALITY ASSURANCE**

A. **Applicator Qualifications:** A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. **Source Limitations:** Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. **Mockups:** Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.

   1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
      a. **Wall Surfaces:** Provide samples on at least 100 sq. ft.
      b. **Small Areas and Items:** Architect will designate items or areas required.

   2. **Apply benchmark samples,** according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
      a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.

   3. **Final approval of colors will be from benchmark samples.**

1.6 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Furnish four unopened gallons of each type of paint and coating work, in color and gloss as used for the Project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Paint Colors (PT-#): Refer to the Finish Schedule on the Drawings.

D. VOC Content for Interior Paints and Coatings: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L (SCAQMD and CARB).
2. Nonflat Paints and Coatings: 50 g/L (SCAQMD) or 100 g/L (CARB).
3. Nonflat, High Gloss Paints and Coatings: 50 g/L (SCAQMD) or 150 g/L (CARB).
4. Dry-Fog Coatings: 50 g/L (SCAQMD) or 150 g/L (CARB).
5. Primers, Sealers, and Undercoaters: 100 g/L.
6. Anticorrosive and Antirust Paints Applied to Ferrous Metals (Industrial Maintenance and Rust Preventative Coatings): 100 g/L (SCAQMD) or 250 g/L (CARB).
7. Zinc-Rich Industrial Maintenance Primers: 100 g/L (SCAQMD) or 340 g/L (CARB).
8. Pretreatment Wash Primers: 420 g/L.
9. Floor Coatings: 50 g/L (SCAQMD) or 100 g/L (CARB).
10. Shellacs, Clear: 730 g/L.
11. Shellacs, Pigmented: 550 g/L.
12. Clear Wood Finishes: 275 g/L.
13. Stains, Exterior: 100 g/L (SCAQMD) or 250 g/L (CARB).
14. Stains, Interior: 250 g/L.

E. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions and technical bulletins for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
   a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
   b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
   c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
   a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
   b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
   c. If transparent finish is required, backprime with spar varnish.
   d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
   e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
   
a. Exterior Exposed Steel: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
   
b. Interior Exposed Steel, in Humid Environments: Clean steel surfaces in accordance with SSPC-SP 6/NACE No. 3 Commercial Blast Cleaning. Abrasive blast cleaned surfaces shall exhibit a uniform, angular profile of 1.5-3.0 mils. Prime cleaned surfaces within 8 hours and prior to surface rusting.
   
c. Interior Exposed Steel, in Dry Environments: Clean steel surfaces in accordance with SSPC-SP2 or SP3 Hand or Power Tool Cleaning.
   
5. Galvanized Surfaces: Clean galvanized surfaces in accordance with SSPC-SP16 Brush off Blast Cleaning of Galvanized Steel and NonFerrous Metals, to achieve a minimum 1 mil anchor profile.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
   
1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
7. Paint backsides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors and doors in wet areas on tops, bottoms, and side edges the same as exterior faces.
9. Sand lightly between each succeeding enamel or varnish coat.
B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:

1. Uninsulated metal piping.
2. Uninsulated plastic piping.
3. Pipe hangers and supports.
4. Tanks that do not have factory-applied final finishes.
5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

G. Electrical items to be painted include, but are not limited to, the following:

1. Switchgear.
2. Panelboards.
3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:

1. The Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.

2. Testing agency will perform appropriate tests for the following characteristics as required by the Architect.

3. The Architect may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 PAINT SCHEDULE

A. Schedule: Provide products and number of coats specified. Use of manufacturer’s proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.

B. Exterior Paint Schedule:

1. Exterior Ferrous Metal, Fluoropolymer System:
   b. One Coat:
      1) Tnemec 90G-1K97 at 3.0 mils DFT; use for touch up.
      2) Dupont Ganicin Urethane Zinc Rich at 3.0 mils DFT.
      3) PPG Coraflon ADS570 Zinc Rich Epoxy Primer at 3.0 mils DFT.
   c. And One Coat:
      1) Tnemec 73 Endura-Shield at 3.0 mils DFT.
      2) Dupont Imron HS at 3.0 mils DFT.
      3) PPG Pitthane HB Urethane 95-8800 at 3.0 mils DFT.
   d. And One Coat:
      1) Tnemec 1070 Fluoronar at 2.0 mils DFT.
         a) Finish: 1078 metallic, 1071 satin, or 1072 semi-gloss.
      2) Dupont Fluoropolymer at 3.0 mils DFT.
      3) PPG Coraflon ADS Fluoropolymer at 1.5-2.0 mils DFT.

2. Exterior Existing Prepainted Steel, for Sandblasting and Painted Finish:
   a. Surface Preparation- SSPC-SP 6 Commercial Blast Cleaning.
   b. One Coat:
      1) Tnemec 90-97 or 90G-1K97 at 3 to 3.5 mils DFT.
      2) PPG PMC Amercoat 68 MCZ at 3.0 mils DFT.
      3) Dupont Ganicin 80% Zinc load Zinc Rich Primer at 3.0 to 3.5 mils DFT.
   c. And One Coat:
      1) Tnemec 73 Endura-Shield at 3.0 to 4.0 mils DFT.
      2) PPG PMC Amerlock 400 at 4.0 DFT.
      3) Dupont Imron 2.8 at 4.0 to 5.0 mils DFT.
   d. And One Coat:
      1) Tnemec 1070, 1071, or 1072 Fluoronar at 2.5 to 3.5 mils DFT.
      2) PPG PMC Corolon Coating at 5.0 mils DFT.
3. Exterior Existing Prepainted Steel, for Overcoat Painted Finish:
   a. Surface Preparation: Water Blast 5000 psi and SSPC-SP3 Power Tool Clean.
   b. One Coat:
      1) Tnemec 394 Omnithane at 3.0 to 3.5 mils DFT.
      2) PPG PMC Amerlock 400 Hi-Build Epoxy at 3.0 to 4.0 mils DFT.
      3) RD Coatings Elasto Metal at 3.0 mils DFT.
      4) International Interplus 356 at 3.0 to 5.0 mils DFT.
   c. And One Coat:
      1) Tnemec 66HS Hi-Build Epoxoline at 3.0 to 5.0 mils DFT.
      2) PPG PMC Amerlock 400 at 3.0 to 4.0 mils DFT.
      3) RD Coatings Elasto Metal at 7.0 mils DFT.
      4) International Intergard 475 HS at 5.0 to 10.0 mils DFT.
   d. And One Coat:
      1) Tnemec 73 Endura-Shield at 3.0 to 5.0 mils DFT.
      2) PPG PMC Amercoat 450H at 3.0 mils DFT.
      3) RD Coatings MurCryl at 3.0 to 4.0 mils DFT.
      4) International Interthane 990 HS at 3.0 to 4.0 mils DFT.

4. Exterior Fiber-Reinforced Cement Board, for Painted Finish:
   a. Factory Primed per Section 074610 - FIBER-CEMENT SIDING.
   b. And Two Coats, Flat Finish: At locations as selected by Architect.
      1) Duron Weathershield Exterior 100% Acrylic Flat House Paint 34-914.
      2) PPG Sun-Proof Exterior Flat Latex 72 line, N105 or 183.
      3) S-W SuperPaint Exterior Latex Acrylic Flat A80 series.
      4) California Paint Fresh Coat 100& Acrylic Velvet Flat 450 series.
   c. And Two Coats, Semi-Gloss Finish: At locations as selected by Architect.
      1) Duron Weathershield Exterior 100% Acrylic Semi-Gloss House Paint.
      2) PPG Sun-Proof Exterior Semi-Gloss Latex 78 line, N096 or 170.
      4) California Paint Fresh Coat Satin-Gloss 100% Acrylic 471 series.

C. Interior Paint Schedule, Typical:

1. Interior Gypsum Wallboard and Plaster, Latex Paint Finish:
   a. One Coat, Primer:
      1) Imperial Paints ECOS Interior Wall Primer.
      2) Moore Ultra Spec 500 Interior Latex Primer 534.
      3) PPG Speedhide Zero VOC Interior Primer 6-4900XI.
      4) S-W Harmony Interior Primer B11 series.
b. And Two Coats, Flat Finish: At ceilings and elsewhere as indicated.
   1) Imperial Paints ECOS Interior Flat.
   2) Moore Ultra Spec 500 Interior Latex Flat 536.
   3) PPG Speedhide Zero VOC Interior Latex Flat 6-4110XI.
   4) S-W ProMar 400 Zero VOC Interior Flat.

c. And Two Coats, Eggshell Finish: At walls and elsewhere as indicated.
   1) Imperial Paints ECOS Interior Eggshell.
   2) Moore Ultra Spec 500 Interior Latex Low Sheen 537.
   3) PPG Speedhide Zero VOC Interior Latex Eggshell 6-4310XI.

d. And Two Coats, Semi-Gloss Finish: At toilet rooms, other wet areas, and elsewhere as indicated.
   1) Imperial Paints ECOS Interior Satin.
   3) PPG Speedhide Zero VOC Interior Latex Semi-Gloss 6-4510XI.

2. Interior Architectural Woodwork, Finish Carpentry, and Wood Doors (softwoods, paint grade hardwoods, MDF, MDO, and hardwood veneers), Latex Paint Finish:

   a. One Coat, Primer:
      1) Imperial Paints ECOS Interior Wood Primer.
      2) Moore Ultra Spec 500 Interior Latex Primer 534.
      3) PPG Speedhide Zero VOC Interior Primer 6-4900XI.

   b. And Two Coats, Semi-Gloss:
      1) Imperial Paints ECOS Interior Satin.
      3) PPG Speedhide Zero VOC Interior Latex Semi-Gloss 6-4510XI.

3. Interior Architectural Woodwork, Finish Carpentry and Millwork (hardwoods and hardwood veneers, except paint grade and factory-finished items), Transparent Polyurethane Finish:

   a. Sand: 120 grit sandpaper.
   c. One Coat, Stain: Not Used.
   d. And Three Coats, Satin Finish:
      1) American Formulating & Manufacturing, Safecoat Polyureseal BP.
      4) Vermont Natural Coatings; PolyWhey Natural Furniture Finish.
   e. Sand Between Urethane Coats: 220 grit sandpaper.
4. **Interior Metals (Not specified to receive other coating systems/not shop finished), Acrylic Paint Finish:**
   
a. **One Coat:** Approved primer, in shop under other Sections (where specified). If not shop primed, provide primer recommended by finish coating manufacturer.
   
b. **And Two Coats:**
      2) PPG Speedhide Zero VOC Interior Latex Semi-Gloss 6-4510XI.

D. **Interior Paint Schedule, High Performance and Specialty Systems:**

1. **Interior Gypsum Wallboard and Plaster at Laboratories, Toilet Rooms, and Other Wet Areas, Urethane Coating:**
   
a. **Surface Preparation:** Cured, clean and dry, free of surface contaminants.
   
b. **One Coat:**
      1) Tnemec 201 Epoxoprime at 3.0-4.0 mils DFT.
      2) PPG PMC Amerlock Sealer at 3.0 to 4.5 mils DFT.
      3) Dupont Hi-Solids Colar primer at 3.0 to 4.0 mils DFT.
      4) International Interseal 670 HS at 3.0 to 4.0 mils DFT.
   
c. **And One Coat:**
      1) Tnemec 280 Tneme-glaze at 6.0 to 8.0 mils DFT.
      2) PPG PMC Amercoat 351 Epoxy at 6.0 to 8.0 mils DFT.
      3) Dupont 100 % Solids Epoxy at 8.0-10.0 mils.
      4) International Interseal 670 HS at 3.0 to 4.0 mils DFT.
   
d. **And One Coat:**
      1) Tnemec 1080 or 1081 Endurashield WB at 3.0 to 3.5 mils DFT.
      2) PPG PMC AmerShield VOC at 2.0 to 3.0 mils DFT.
      3) Dupont WB Urethane at 3.5 to 4.0 mils DFT.
      4) International Water Borne Urethane at 3.0 to 4.0 mils DFT.

2. **Interior Gypsum Wallboard, Epoxy/Acrylic Coating:**
   
a. **Surface Preparation:** Cured, clean and dry, free of surface contaminants.
   
b. **Two Coats:** Tnemec 27WB at 8-10 mils DFT.
   
c. **And One Coat:** Tnemec 1028 at 2-3 mils DFT.

E. **Mechanical and Electrical Work:** Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork. Same as specified for other interior metals, hereinafore.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Markerboards.
2. Tackboards.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 099000 - PAINTING AND COATING for primers under marker wall covering.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of visual display surfaces.
2. Fabric swatches fabric-faced tack assemblies.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show location of panel joints.
2. Show location of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

E. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of visual display surface through one source from a single manufacturer.
B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display boards, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefabricate components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display units vertically with packing materials between each unit.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating visual display surfaces without field measurements. Coordinate wall construction to ensure that actual dimensions correspond to established dimensions.

2. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

PART 2 - PRODUCTS

2.1 BASIS-OF-DESIGN

A. Basis-of-Design Products: Refer to the Finish Schedule on the Drawings.

2.2 MARKERBOARD ASSEMBLIES

A. Porcelain-Enamel Markerboard Assembly: Balanced, high-pressure, factory-laminated markerboard assembly of 3-ply construction consisting of backing sheet, core material, and 0.021-inch-thick, porcelain-enamel face sheet.

1. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing with binder containing no added urea formaldehyde.

2. Fire Rating: ASTM E 84, Class A.


4. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.

2.3 TACKBOARD ASSEMBLIES

A. Linoleum Resilient Tackboard: Uni-color linoleum resilient homogeneous tackable surface consisting of linseed oil, granulated cork, rosin binders and dry pigments calendared onto a natural burlap backing with integral color throughout with surface-burning characteristics indicated.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Forbo Industries; Bulletin Board.
   b. WallTalkers; Tac-wall.

2. Thickness: 1/4 inch.

3. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard backing with binder containing no added urea formaldehyde.

4. Fire Rating: ASTM E 84, Class A.

5. Colors: Refer to Finish Schedule.

B. Fabric-Wrapped Tackboard:

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. Claridge Products & Equipment, Inc.
   b. Egan Visual Inc.
   c. MooreCo; Best-Rite Manufacturing.
   d. Peter Pepper Products.
   e. Steelcase Company.

2. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard backing with binder containing no added urea formaldehyde.

3. Fire Rating: ASTM E 84, Class A.

4. Fabric Facing Material, Colors and Patterns: Refer to Finish Schedule.

2.4 ACCESSORIES

A. Aluminum Frames and Trim: Factory-applied, fabricated from not less than 0.062-inch-thick, extruded aluminum; of size and shape indicated.

1. Chalk/Marker Tray: Manufacturer's standard, continuous tray.

B. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific visual display surfaces and substrate application, as recommended in writing by visual display surface manufacturer.

1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.

C. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to neat, hairline closure.
2.6 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

D. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

A. Remove dirt, scaling paint, projections, and depressions that will affect smooth, finished surfaces of visual display boards.

B. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, and substances that will impair bond between visual display boards and surfaces.

3.3 INSTALLATION

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Join adjacent wall panels with concealed steel splines for smooth alignment.
2. Where markerboards abut, install with clean, trimless butt joints.

3.4 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION
SECTION 10 14 00
SIGNAGE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS
A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK
A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Code-required interior panel signage, including but not limited to, accessibility signage, toilet room signage and mechanical and electrical room signage.

1.3 SUBMITTALS
A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
   1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
C. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
   1. Panel Signs: Full-size Samples of each type of sign required.
   2. Approved samples will not be returned for installation into Project.
D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE
A. Source Limitations: Obtain each sign type through one source from a single manufacturer.
B. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5 PROJECT CONDITIONS
A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.
1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).

B. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing, suitable for exterior applications.

C. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by the sign manufacturer for the casting process used and for the use and finish indicated.

2.2 PANEL SIGNS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Manufacturers of Panel Signs:
   b. Welch Architectural Signage.

B. Substrate: Fabricate signs from 1/16" laminated to 1/8" thick solid acrylic substrate with edges mechanically and smoothly finished to eliminate cut marks.

1. Background Color: Custom, up to five colors.
2. Edge Condition: Straight.
3. Size: 6 inch round, unless noted otherwise.

C. Copy: Helvetica.

D. Letterform: Route copy into face of substrate 1/32 inch deep. Chemically weld (inlay) computer precision cut tactile copy into routed letter openings so that tactile copy is embedded in substrate and remains at least 1/32" above surface of substrate.


E. Braille: Use engrave process for all Braille areas. Engrave Braille dots into surface of material. Tactile in color 3XI-398 Graphite.

F. Symbols of Accessibility:

1. Accessible elements: Provide international symbol of accessibility.
   a. Provide male and female symbols as required for toilets.

G. Provide characters complying with ADA Accessibility Guidelines and ICC/ANSI A1 17.1. Text shall be accompanied by Grade 2 braille.
2.3 DIMENSIONAL LETTERS AND NUMBERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

2. ASI Sign Systems, Inc.
3. Gemini, Inc.
4. Metal Arts.
5. Spanjer Brothers, Inc.
6. Vomar Products, Inc.

B. Plastic Letters: Produce characters with smooth, flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, or other defects. Comply with requirements indicated for finish, style, and size.

1. Plastic Sheet: Not less than 0.080 inch thick.
2. Letter Height: 3-1/2 inch.
3. Letter Style: As selected by Architect.
4. Painted, custom color: As directed by Architect.

2.4 FINISHES, GENERAL

A. 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.

2.5 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy and background and frame colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for three years for application intended.

B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

C. Aluminum Finishes: Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

1. Class II Clear Anodized Fine Satin Finish: AA-M31C21A31 (Mechanical Finish: Fine satin directional textured; Chemical Finish: Fine matte etched finish; Anodic Coating: Class II Architectural, clear film thicker than 0.4 mil).
2. Satin Aluminum Finish, matte edge.
3. Provide satin aluminum finish for interior and clear anodized finish for exterior.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
B. Verify that items provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

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

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

C. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.

1. Adhered Mounting: Mount plastic numbers flush with the wall surface.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by the Architect.

3.4 PANEL SIGN SCHEDULE

A. Flat Cut Acrylic Signage:

1. University of Maine Farmington Sweatt-Winter Childcare and Early Education Center.

2. Size: 3-1/2 h by 1-1/2d inch

3. Finish: Custom painted, color as directed by Architect.

B. Provide sign one per door panel consisting of room name, number. Toilet Rooms, Mother's Room, and locations as indicated on Drawings, provide raised pictograms in addition to room name and braille.

C. Final room names and numbers will be verified during the submittal.

3.5 CAST LETTER SCHEDULE

A. Provide six cast aluminum numbers for selected exterior entrances around the building. Provide numeral indicated in schedule, 18 inches high.
1. On the interior wall above each exit scheduled, provide 12 inch high, matching numeral of plastic located above the exit door.

3.6 VINYL GRAPHIC SIGNS

A. Provide 4 inch high numerical vinyl graphics at window within each room per Homeland Security/Fire Rescue guidelines.

B. Provide 4 inch high vinyl graphics installed as indicated on Drawings.

END OF SECTION
SECTION 10 21 10
TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS
A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK
A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Phenolic-core toilet compartments and screens, floor-mounted and overhead braced.
B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
   1. Section 102800 - TOILET ACCESSORIES for partition mounted accessories.

1.3 SUBMITTALS
A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of cutouts for compartment-mounted toilet accessories.
C. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

1.4 QUALITY ASSURANCE
A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: 25 or less.
   2. Smoke-Developed Index: 450 or less.
B. Regulatory Requirements: Comply with applicable provisions of Massachusetts Architectural Access Board and the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG) for compartment door operating hardware and compartments designated as accessible."
C. Regulatory Requirements: Comply with applicable provisions of ICC A117.1 and the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG) for compartment door operating hardware and compartments designated as accessible."
1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate with the work of Section 061000 - ROUGH CARPENTRY for locations requiring wood blocking or flat plate reinforcing within partitions for compartment mounting.

PART 2 - PRODUCTS

2.1 PHENOLIC-CORE UNITS

A. Basis of Design: Subject to compliance with requirements, provide products indicated on Drawings or comparable product by one of the following:

1. Accurate Partitions Corporation.
2. Bradley Corporation; Mills Partitions.
3. Flush Metal Partition Corp.
5. Global Steel Products Corp.
7. Metpar Corp.

B. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch-thick doors and pilasters and minimum 1/2-inch-thick panels.

1. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
2. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

C. Urinal-Screen Construction:

1. Flat-Panel Urinal Screen: Wall-mounted, matching panel construction.

D. Brackets and Fittings: Manufacturer's standard design.

1. Full-Height (Continuous) Type Brackets: Stainless steel.
2. Pilaster Shoes and Sleeves (Caps): Stainless-steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.
3. Stainless-Steel Finish: No. 4 bright, directional polish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.
E. Phenolic-Panel Finish: Apply one color in each room.
   1. Color: As selected by Architect from manufacturer's full range.
   2. Core Color: Manufacturer's standard dark color core.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
   2. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Floor-Mounted, Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, in-swinging doors for standard toilet compartments and 36-inch-wide, out-swinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
   1. Maximum Clearances:
      a. Pilasters and Panels: 1/2 inch.
      b. Panels and Walls: 1 inch.
   2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
      a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
      b. Align brackets at pilasters with brackets at walls.

B. Floor-Mounted, Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
C. Wall-Hung Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb and to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer’s written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and doors in entrance screens to return doors to fully closed position.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Corner guards.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for concealed wood blocking.
2. Section 087100 - DOOR HARDWARE for metal armor, kick, mop, and push plates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Corner Guards: 12 inches long. Include examples of joinery, corners, and field splices.

C. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 Sections.
1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.


1.5 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.7 EXTRA MATERIAL

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. Corner Guard, and Wall-Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of cover installed, but no fewer than two, 96-inch long units.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide handrails capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform load of 50 lbf/ft. applied in any direction.
2. Concentrated load of 200 lbf applied in any direction.
3. Uniform and concentrated loads need not be assumed to act concurrently.
2.2 MANUFACTURERS
A. Basis of Design: Subject to compliance with requirements, product product indicated on Drawings or an Architect approved equal.

2.3 MATERIALS
A. PVC-Free Plastic Material: Engineered PETG free of PVC, phthalates, persistent bioaccumulative toxins (PBT) and bisphenol A (BPA) with UL® Class A/1 fire rating.
B. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
C. Adhesive: Type recommended by manufacturer for use with material being adhered to substrate indicated.
   1. Adhesives, General: Do not use adhesives that contain urea formaldehyde.
   2. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
      a. Wood Glues: 30 g/L.
      b. Contact Adhesive: 80 g/L.
      c. Special Purpose Contact Adhesive: 250 g/L.

2.4 CORNER GUARDS
A. Surface-Mounted, Plastic Cover, Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
   1. Cover: Extruded rigid plastic, minimum 0.078-inch wall thickness.
      a. Profile: Nominal 2-inch long leg and 1/4-inch corner radius.
      b. Color and Texture: Refer to Finish Schedule.
   2. Retainer: Minimum 0.060-inch thick, one-piece, extruded aluminum.
   3. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
   4. Height: As indicated on Drawings.

2.5 FABRICATION
A. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
B. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.

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

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.

B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.

2. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches apart.

3. Adjust end and top caps as required to ensure tight seams.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer

C. Remove paper covering from stainless steel corner guards after installation, and thoroughly clean.

END OF SECTION
SECTION 10 28 00
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Toilet accessories as scheduled on the Drawings. Coordinate with Owner for accessories provided by Owner.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for blocking.
2. Section 088000 - GLAZING for frameless mirrors.

1.3 SUBMITTALS

A. 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.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated on Drawings.
2. Identify products using designations indicated on Drawings.

C. Maintenance Data: For toilet accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
1.5 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 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide products indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch (0.9-mm) minimum nominal thickness.


D. 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.

2.3 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to the Owner.

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 method in 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 10 41 00
EMERGENCY ACCESS AND INFORMATION CABINETS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS
A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK
A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Fire department key vault box.
B. Related Work: The following items are not included in this Section and are specified under the designated Sections:
   1. Section 061000 - ROUGH CARPENTRY for wood blocking.

1.3 SUBMITTALS
A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each product and system used. Provide manufacturer's certifications stating that products and systems comply with requirements.
B. Shop Drawings: Provide large scale shop drawings for fabrication, installation and erection of all parts of the work. Provide plans, elevations, and details of anchorage, connections and accessory items. Provide installation templates for work installed by others.
C. Contractor's Review: Before commencing work, submit signed statement that Contract Documents have been reviewed with a qualified representative of supplier/manufacturer, and that selected materials and construction are proper, compatible, and adequate for application shown.

PART 2 - PRODUCTS

2.1 FIRE DEPARTMENT KEY VAULT BOX
A. Fire Department Key Vault Box: Provide at building entrance; location shall be acceptable to local Fire Department.
   1. Basis of Design: Knox Company; Model 3200 Knox-Box, Recessed Mounted Type.
   2. Finish: Weather resistant TGIC polyester powder coat, color as selected by local Fire Department.
   3. Locking: Provide lock and keys acceptable to local Fire Department.
   5. Accessories:
a. Provide manufacturer’s standard recessed mounting kit, for installation in specified construction.
b. Provide alarm tamper switches, UL listed.

PART 3 - EXECUTION

3.1 INSPECTION

A. Rough-In Work: Examine installation of walls and other conditions under which work is to be installed; verify dimensions of services and substrates before fabricating work.

B. Notify Contractor of unsatisfactory locations and dimensions of other work and of unsatisfactory conditions for proper installation of equipment. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions have been corrected in manner satisfactory to Installer.

3.2 FIRE DEPARTMENT KNOX BOX INSTALLATION

A. General: Set each item of equipment securely in place, level, and adjust to correct height, 4 ft. - 0 in. AFF, unless otherwise required by local Fire Department.

B. Anchor to supporting substrate where indicated and where required for sustained operation and use without shifting or dislocation. Conceal anchorage where possible. Seal perimeter joints in accordance with Section 079200 - JOINT SEALANTS.

3.3 CLEANING

A. After completion of installation and other major work remove protective coverings, if any, and clean equipment, internally and externally. Restore exposed and semi-exposed finishes to remove abrasions and other damages; polish exposed-metal surfaces and touch-up painted surfaces. Replace work that cannot be successfully restored.

END OF SECTION
SECTION 10 43 13

AUTOMATIC EXTERNAL DEFIBRILLATOR (AED) CABINETS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Automatic external defibrillator (AED) cabinets.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood blocking.
2. Division 26 - ELECTRICAL for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.
3. Division 28 - ELECTRONIC SAFETY AND SECURITY for door alarm connection and opening monitoring connection.

1.3 COORDINATION

A. Coordinate size of AED cabinets to ensure compatibility with Owner-furnished AED devices.

B. Coordinate fire-rating of AED cabinets with fire-rated partitions to ensure partition fire-rating is maintained.

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1. Show locations and details for installing electrical wiring, alarm and monitoring components and switches.

1.5 QUALITY ASSURANCE

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.
B. Source Limitations: Obtain AED cabinets through one source from a single manufacturer.

C. Fire-Rated AED Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and protect defibrillator cabinets and related materials using means and methods that will prevent damage, deterioration, or loss.

B. Deliver components in manufacturer's original packaging, properly labeled for identification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:

1. JL Industries, Inc.
2. Larsen’s Manufacturing Company.
3. Potter Roemer; Div. of Smith Industries, Inc.
4. Zoll Medical Corporation.

B. Basis-of-Design: Subject to compliance with requirements, provide JL Industries 1400 Series Lifestart Series recessed AED cabinets, or comparable products from available manufacturers, as approved by Architect.

1. Cabinet Style: Recessed.
2. Size: 14 inches high by 14 inches wide by 6-3/4 inches deep, unless otherwise indicated.
3. Components:
   b. Tub Material: Cold-rolled steel.
   c. Door and Trim Construction: Flush doors with 5/8 inch door stop attached by continuous hinge and equipped with zinc-plated with roller catch.
      1) Finish: Factory-applied ground and polished finish; #4 directional satin finish.
      2) Finish: Factory-applied powder coat finish; color as selected by Architect from manufacturer’s full range.
      3) Door Style: Fully-tempered glazing; pull and AED signage.
   d. Trim Style and Depth: 3/8-inch flat trim.
   e. Trim Dimensions: 1-3/4 inch face trim on door and frame.
4. Fire Rating: As indicated for partition type on Drawings.
5. Alarms: 85 db alarm (audible) alarm, battery operated. Alarm stays on 2-minutes after door is closed.
6. Alarm Contacts: Contact devices, coordinate with Owner’s existing alarm systems.
7. Cabinet Lettering: AED identifying decal, as selected by Architect from manufacturer’s full line.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed, and blocking where surface mounted cabinets will be installed.

1. Notify the Architect, in writing of conditions detrimental to proper and timely completion of the installation.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections.

B. Install cabinets in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.

1. Prepare recesses in walls for defibrillator cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
2. Securely fasten cabinets to structure, square and plumb, to comply with manufacturer's instructions.
3. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.
4. Verify alarm is in proper working order and coordinate any additional security connections required with Owner's security personnel.

C. Cabinet Lettering: Install on face of glass surface.

3.3 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as defibrillator cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace cabinets that cannot be restored to factory finished appearance. Use only materials and procedures recommended or furnished by cabinet manufacturer.

E. Replace cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Portable fire extinguishers.
2. Fire-protection cabinets for portable fire extinguishers.
3. Mounting brackets for fire extinguishers.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 099000 - PAINTING AND COATING for field painting fire-protection cabinets.
2. Division 21 - FIRE PROTECTION for fire hose valves and standpipes.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each item.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.
1.5 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

B. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

2.2 FIRE-PROTECTION CABINET

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Nystrom Building Products.
4. Potter Roemer; Div. of Smith Industries, Inc.

B. Cabinet Type: Suitable for fire extinguisher.


D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

   1. Trimless with Plaster Stop: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as plaster stop. If wall condition does not allow for trimless with plaster stop, provide flat 5/16 inch trim of same material as the cabinet box.

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

   1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.

F. Door Material: Steel sheet with baked enamel finish, color as selected.

G. Door Style: Vertical duo panel with frame.

H. Door Glazing: Tempered glass.

I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

J. Accessories:
1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

2.4 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.

2. Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material.

   a. Provide factory-drilled mounting holes.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.

2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. 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 walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

B. Examine fire extinguishers for proper charging and tagging. Contractor shall be responsible for fire extinguisher tagging by a certified service technician located within 75 miles of the project.
   1. Remove and replace damaged, defective, or undercharged units.

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

3.2 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire-protection specialties in locations and at mounting heights indicated on the Drawings and acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
   1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire-protection cabinets.
   2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

D. Identification: Apply vinyl lettering at locations indicated.

3.4 INSTALLATION OF FIRE-RATED CABINETS

A. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.

B. Seal through penetrations with firestopping sealant as specified in Section 078410 - PENETRATION FIRESTOPPING.

3.5 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.

E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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. This Section includes the following:
   1. Horizontal mailboxes.

1.3 REFERENCED STANDARDS
   1. ASTM A 653/A 653M: Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   5. ASTM F 1554: Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
B. NAAMM - National Association of Architectural Metal Manufacturers.
   1. Metal Finishes Manual for Architectural and Metal Products.
C. SSPC - The Society for Protective Coatings.
D. USPS - United States Postal Service.
   1. USPS Publication 16: Mail Chutes, Receiving Boxes, and Auxiliary Collection Boxes.

1.4 SUBMITTALS
A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of postal specialty.
B. Shop Drawings: For each type of postal specialty. Include plans, elevations, sections, details, and attachments to other work.
C. Samples: For each type of exposed finish required, prepared on 6 by 6-inch (152 by 152 mm) square Samples.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: An authorized representative of postal specialty manufacturer for installation of units required for this Project.
B. Source Limitations: Obtain postal specialties through one source from a single manufacturer.
C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING
A. Deliver lock keys to Owner by registered mail or overnight package service with a record of each corresponding lock and key number.

1.7 COORDINATION
A. Coordinate layout and installation of recessed postal specialties with wall construction.
B. Templates: Obtain and distribute to parties involved templates for installing postal specialties.

1.8 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of postal specialties that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures.
      b. Faulty operation of hardware, except door locks.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   2. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Bommer Industries, Inc.
   2. Florence Corporation; a Gibraltar Industries company.
B. Basis-of-Design: Series 3700 by Salsbury Industries.
   1. Type: Recessed Mounted 4C horizontal mailboxes, front loading.
2. Layout: As indicated on the Drawings.
3. Locks: Provide locks to owner for possible future use. Install dummy plate at lock locations.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, and as follows:
   2. Extruded Shapes: ASTM B 221.

B. Metallic-Coated Steel Sheet: Galvanized steel sheet, ASTM A 653/A 653M, G60 coating designation; extra smooth where exposed; or electrolytic zinc-coated steel sheet, ASTM A 879/A 879M, Coating Designation 08Z.

C. Steel Anchor Bolts, Nuts, and Washers: ASTM F 1554, Grade 36 or 55, hot-dip galvanized.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.3 HORIZONTAL MAILBOXES

A. USPS-Approved, Front-Loading, Horizontal Mailboxes: Consisting of multiple compartments with fixed, solid compartment backs, enclosed within recessed wall box. Provide access to compartments for distributing incoming mail from front of unit by unlocking master lock and swinging side-hinged master door to provide accessibility to entire group of compartments. Provide access to each compartment for removing mail by swinging compartment door. Comply with USPS STD-4C.

   1. Mail Delivery: USPS.
   2. Mounting: Boxes are recessed in interior partitions.
   3. Front-Loading Master Door: Fabricated from extruded aluminum and braced and framed to hold compartment doors; with master door lock and concealed, full-length, stainless-steel piano hinge on one side. Fabricate master door to remain open while mail is deposited.
      a. Master Door Lock: Cylinder lock keyed to building keying system; with two keys. Provide cylinders specified in Section 087100 "Door Hardware."

   4. Compartment Doors: Fabricated from aluminum sheet reinforced with vertical stiffeners. Equip each compartment door with lock, tenant identification, and concealed, full-length, flush hinge on one side. Provide one compartment with outgoing mail slot and prepared for master door lock.
      a. Compartment Door Locks: 5-pin tumbler, cylinder cam locks capable of at least 1000 key changes; with 2 keys for each compartment door. Key each compartment differently.

   5. Frames: Fabricated from extruded aluminum or aluminum sheet; ganged and nested units, with cardholder for tenant's identification behind each compartment.

   6. Snap-on Trim: Fabricated from same material and finish as compartment doors.
7. Concealed Components and Mounting Frames: Aluminum or steel sheet.
8. Aluminum Finish: Color anodized as selected by Architect.

2.4 ACCESSORIES
A. General: Unless otherwise indicated, provide accessories fabricated by same manufacturer as apartment mailboxes.

2.5 FABRICATION
A. Preassemble postal specialties in shop to greatest extent possible to minimize field assembly. Form postal specialties to required shapes and sizes, with true lines and angles, square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges and corners free of sharp edges and burrs, and safe to touch.
B. Mill joints to a tight, hairline fit. Cope or miter corner joints. Form joints exposed to weather to exclude water penetration.
C. Drill or punch holes required for fasteners and remove burrs. Use security fasteners where fasteners are exposed. If used, seal external rivets before finishing.
D. Comply with AWS for recommended practices in shop welding. Provide welds behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded joints of flux, and dress exposed and contact surfaces.
E. Fabricate doors of postal specialties to preclude binding, warping, or misalignment.
F. Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturers of dissimilar metals.

2.6 FINISHES, GENERAL
A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Finish postal specialties after assembly.
D. 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.

2.7 ALUMINUM FINISHES
A. Aluminum: Color anodized as selected by Architect.
2.8 STEEL FINISHES
A. Unless otherwise indicated, finish steel surfaces exposed to view with baked-enamel or powder-coated finish.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, roughing-in openings, clearances, and other conditions affecting performance of work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
B. Examine walls for suitable conditions where recessed units will be installed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. General: Install postal specialties level and plumb, according to manufacturer's written instructions and roughing-in drawings.
   1. Metal Protection: Where aluminum and copper alloys will contact grout, concrete, masonry, wood, or dissimilar metals, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturers of dissimilar metals.
   2. Final acceptance depends on compliance with USPS requirements.
B. Horizontal Mailboxes: Install horizontal apartment mailboxes with center of tenant-door lock cylinder not more than 67 inches (1702 mm) above finished floor and bottom of lowest compartment not less than 28 inches (711 mm) above finished floor.
   1. Arrange compartments in groups, with not more than 35 and not less than 4 compartments operated by 1 master lock.
   2. Install door lock cylinders.

3.3 ADJUSTING, CLEANING, AND PROTECTION
A. Remove temporary protective coverings and strippable films, if any, as postal specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
B. Adjust doors to operate easily without binding. Verify that integral locking devices operate properly.
C. On completion of postal specialty installation, clean interior and exterior surfaces as recommended by manufacturer.
D. Touch up marred finishes, or replace postal specialties that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by postal specialty manufacturer.
E. Replace postal specialties that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain postal specialties. Refer to Section 017700 "Closeout Procedures."

END OF SECTION 105500
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Fixed awnings, at building exterior.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for blocking, nailers, shims, reinforcing, framing, and furring for connecting to awning frame and anchorage.

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes for awnings.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, mounting heights, and attachment details.

2. Detail fabrication and assembly of awnings, including seam layout, spacing, and orientation of awning fabric.

3. Show locations for blocking, reinforcement, and supplementary structural support.

4. Graphics: Show text message, font, character sizes, and other graphic forms, character spacing, word spacing, line spacing, margin widths, position of copy, and other information related to graphic design.

C. Samples: For each exposed product and for each color and texture specified.

D. Delegated-Design Submittal: For awnings.

E. Product Certificates: For each type of awning fabric.

F. Evaluation Reports: For anchors and fasteners, from ICC-ES.
G. Operation and Maintenance Data: For awnings to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

1. Fabricator's responsibilities include fabricating and installing awnings and providing professional engineering services needed to assume engineering responsibility.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation of awnings in exterior locations to be performed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements: Where awning installation is indicated to fit to other work, verify dimensions of other work by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for fenestration operation throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 WARRANTY

A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of awnings that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including framework.
   b. Deterioration of fabric including seam failure.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Awning Warranty Period: Five years from date of Substantial Completion.
3. Fabric Warranty Period: Five years from date of Substantial Completion.
4. Graphics Warranty Period: Outdoor durability not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide products by Acrylic Sunbrella or comparable product by one of the following:
1. Architectural Shade Products.
2. Eide Industries.
3. Rainer Industries.
4. Steel Stitch Corp

B. Source Limitations: Obtain awnings from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design awnings and anchorage to building.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Regulatory Requirements: Provide awnings complying with requirements of authorities having jurisdiction.

2.3 AWNING FABRICS

A. Fire-Test-Response Characteristics: Provide awning fabrics with the fire-test-response characteristics indicated, as determined by testing identical products according to test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

2. Permanently attach label to each awning fabric indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals, and whether it requires retreatment after designated time period or cleaning.

B. Design: As indicated on Drawings.

C. Fiber Type: Glen Raven Custom Fabrics; Sunbrella.

D. Fabric Fiber Content: Vinyl-laminated or -coated polyester.

1. Fabric Weight: 10 ounces min.
2. Bottom Hem: As indicated on Drawings.
3. Trim: To be selected by Architect from manufacturer's standards.
4. Color: Single color as selected by Architect from manufacturer's full range.
5. Performance Characteristics: As follows:

   a. Mildew Resistance: Showing no growth when tested according to ASTM G 21.

E. Graphic Application: Vinyl or PVDF film with pressure-sensitive adhesive backing.

1. Graphic and Text Image: To be provided by Owner.

F. Thread: 100 percent expanded PTFE or 100 percent bonded polyester, UV-light, mildew, and rot resistant.

G. Accessories: Provide side wraps.
2.4 AWNING FRAMES

A. Aluminum Frames: Alloy and temper recommended by awning manufacturer for type of use and finish indicated and with not less than the strength and durability properties of alloy and temper required by structural loads.

1. Aluminum Plate and Sheet: ASTM B 209.
3. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, standard weight (Schedule 40) unless another weight is indicated or required by structural loads.
5. Aluminum Finish: Manufacturer's standard decorative paint finish complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
6. Depth: 3 feet.
7. Thickness: 1 inch.

B. Anchors, Fasteners, Fittings, Hardware, and Installation Accessories: Complying with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated. Corrosion-resistant or noncorrodible units; weather-resistant, compatible, nonstaining materials. Provide as required for awning assembly, mounting, and secure attachment. Number as needed to comply with performance requirements and to maintain uniform appearance; evenly spaced. Where exposed to view, provide finish and color as selected by Architect from manufacturer's full range.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 AWNING FABRICATION

A. Fabrics: Reinforce wear points and hardware attachment points with webbing. Seam fabrics as follows:

1. Fabric Edges and Seams: Manufacturer's standard hemming and seaming methods.

B. Frames: Preassemble awning frames in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

1. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
2. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
3. Weld corners and connections continuously. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed corners and connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
4. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications in place and to properly transfer loads.

C. Colors of Metal and Plastic Components Exposed to View: Matching or coordinating with awning fabric color.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, lighting, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. General: Install awnings at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and fabricator's written instructions.

B. Install awnings after other finishing operations, including joint sealing and painting, have been completed.

C. Attach fabric to frames as recommended by fabricator, to ensure tight, wrinkle-free fit of fabric to frame.

D. Weld frame connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

1. Field Welding: Comply with the following requirements:
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove welding flux immediately.
   d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing awnings to structural support and for properly transferring load to in-place construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

G. Coordinate awning installation with flashing and joint-sealant installation so these materials are installed in sequence and in a manner that prevents exterior moisture from passing through completed exterior wall and roof assemblies.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly, and lubricate as recommended by retractable-awning manufacturer.
3.4 CLEANING AND PROTECTION

A. Touchup Painting: Immediately after erection, clean field welds, connections, and abraded areas. Paint uncoated and abraded areas with same or compatible material as used for shop-applied finish painting.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Galvanized Surfaces: Clean field welds, connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION
SECTION 11 31 00

APPLIANCES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Appliances.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Division 22 - PLUMBING for water distribution piping connections, drainage and vent piping connections, sinks, and waste disposers.
2. Division 26 - ELECTRICAL for services and connections to appliances.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include operating characteristics, dimensions of individual appliances, and finishes for each appliance.

B. Appliance Schedule: For appliances; use same designations indicated on Drawings.

C. Maintenance Data: For each product to include in maintenance manuals.

D. Warranties: Special warranties specified in this Section.

1.4 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: Provide products from same manufacturer for each type of appliance required.

C. Regulatory Requirements: Comply with provisions of the following product certifications:

1. NFPA: Provide electrical appliances listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
2. UL and NEMA: Provide electrical components required as part of residential appliances that are listed and labeled by UL and that comply with applicable NEMA standards.

3. ANSI: Provide gas-burning appliances that comply with ANSI Z21 Series standards.

D. Regulatory Requirements, Accessibility: Where residential appliances are indicated to comply with accessibility requirements, comply with Massachusetts Architectural Access Board requirements and the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer of each appliance specified agrees to repair or replace residential appliances or components that fail in materials or workmanship within manufacturer's standard warranty period.

PART 2 - PRODUCTS

2.1 APPLIANCES

A. Appliances. Appliances provided by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for piping systems to verify actual locations of piping connections before equipment installation.

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

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written instructions.

   1. Range Hood, Exhaust Fans, and Dryer Vents: Vent directly to the building exterior.

B. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and 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: Refer to Division 22 - PLUMBING for plumbing requirements and Division 26 - ELECTRICAL for electrical requirements.
3.3 CLEANING AND PROTECTION

A. Test each item to verify proper operation. Make necessary adjustments.

B. Verify that accessories required have been furnished and installed.

C. Remove packing material from appliances and leave units in clean condition, ready for operation.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train the Owner’s maintenance personnel to adjust, operate, and maintain appliances.

END OF SECTION
SECTION 12 24 00

SHADES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Roller shades with manual and motorized shade operators.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 061000 - ROUGH CARPENTRY for wood blocking and grounds for mounting roller shades and accessories.
2. Division 26 - ELECTRICAL for electrical service and connections for motor operators, controls, limit switches, and other powered devices and for system disconnect switches for motorized shade operation.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
3. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.

1. Motorized Shade Operators: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.
2. Wiring Diagrams: Power, system, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Ceiling suspension system members and attachment to building structure.
2. Ceiling-mounted or penetrating items including light fixtures, air outlets and inlets, speakers, sprinklers, recessed shades, and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
3. Shade mounting assembly and attachment.
4. Size and location of access to shade operator and adjustable components.
5. Minimum Drawing Scale: 1/4 inch = 1 foot.

D. Samples for Initial Selection: For each colored component of each type of shade indicated.
   1. Include similar Samples of accessories involving color selection.

E. Samples for Verification:
   1. Complete, full-size operating unit not less than 16 inches wide for each type of roller shade indicated.
   2. For the following products:
      a. Shade Material: Not less than 12-inch square section of fabric, from dye lot used for the Work, with specified treatments applied. Show complete pattern repeat. Mark top and face of material.
      b. Valance: Full-size unit, not less than 12 inches long.

F. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.

G. Product Certificates: For each type of roller shade, signed by product manufacturer.

H. Qualification Data: For Installer.

I. Product Test Reports: For each type of roller shade.

J. Maintenance Data: For roller shades to include in maintenance manuals. Include the following:
   1. Methods for maintaining roller shades and finishes.
   2. Precautions about cleaning materials and methods that could be detrimental to fabrics, finishes, and performance.
   3. Operating hardware.
   4. Motorized shade operator.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 EXTRA MATERIALS (ATTIC STOCK)

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Rollers Shades: Before installation begins, provide one full-size shade unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Draper Inc.
3. MechoShade Systems, Inc.

2.2 ROLLER SHADES

A. Shadecloth: 100% polyester or PLA biopolymer fabric, PVC-free.

1. Solar Control Type: Provide transparent type shadecloth with percentage as acceptable to Architect.
2. Black-Out Type: Provide black-out type shadecloth at selective locations as directed by Architect.
5. Low-Emitting Materials: Provide adhesives and sealants in compliance with the requirements of the California Department of Public Health's "Standard Method for the..."
Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

a. GreenGuard Gold certification.

7. Colors: To be selected by Architect from manufacturer’s full range.

B. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material.

1. Direction of Roll: Regular, from back of roller

C. Mounting Brackets: Galvanized or zinc-plated steel.

D. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated on Drawings removable design for access.

E. Top/Back Cover: L-shaped; material and finish to match fascia; combining with fascia and end caps to form a six-sided headbox enclosure sized to fit shade roller and operating hardware inside.

F. Pocket-Style Headbox: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or an openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

G. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.

H. Mounting: As indicated on Drawings, mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.

I. Hold-Down Brackets and Hooks or Pins: Manufacturer’s standard for anchoring roller shade bottom in place and keeping shade band material taut.

2.3 ROLLER SHADE FABRICATION

A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.

1. Lifting Mechanism: With permanently lubricated moving parts.

C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.

2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.

E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.

F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.

2.4 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard.
   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Clip, jamb mount.

2.5 MOTORIZED ROLLER SHADE OPERATORS

A. General: Provide factory-assembled motorized shade operation systems designed for lifting shades of type, size, weight, construction, use, and operation frequency indicated. Provide operation systems of size and capacity and with features, characteristics, and accessories suitable for Project conditions and recommended by shade manufacturer, complete with electric motors and factory-prewired motor controls, remote-control stations, remote-control devices, power disconnect switches, enclosures protecting controls and all operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with the building electrical system.

B. Comply with NFPA 70.

C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6 with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

D. Electric Motors: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.

1. Service Factor: According to NEMA MG 1, unless otherwise indicated.

E. Position of Motor and Electrical Connection: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.

F. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:

1. Control Stations: Keyed, maintained-contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.

2. Group Control Stations: Maintained-contact, three-position, rocker-style, wall switch-operated control station with open, close, and center off functions for single-switch group control.
   a. Color: White

3. Microprocessor Controls: Electronic programmable means for setting, changing, and adjusting control features. Provide unit isolated from voltage spikes and surges.

G. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.

H. Operating Function: Stop and hold shade at any position

I. Operating Features: Include the following:

1. Group switching with integrated switch control; single face plate for multiple switch cut-outs.
2. Capable of interface with audiovisual control system.
3. Capable of accepting input from building automation control system.
4. Override switch.
5. Backup gear and crank operator for manual operation during power failures with detachable handle, length required to make operation convenient from floor level

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, other conditions affecting performance.

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

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Connections: Connect motorized operators to building electrical system.
3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel to adjust, operate, and maintain roller shades. Refer to Division 01 Sections for contract closeout procedures.

END OF SECTION
PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within
DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of
the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this
Section, including but not limited to the following:

1. Stone countertops.
2. Undermount sinks furnished by plumbing subcontractor, installed by countertop fabricator
   in shop and delivered to the site with sinks installed.

B. Related Work: The following items are not included in this Section and will be performed under
the designated Sections:

1. Section 064020 - INTERIOR ARCHITECTURAL WOODWORK for plastic laminate
countertops.
2. Section 079200 - JOINT SEALANTS for joint sealer at stone countertops.
3. Section 113100 - APPLIANCES.
4. Section 123572 - KITCHEN AND BATH CASEWORK for plastic laminate countertops.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1. Each variety of stone. Include data on physical properties required by referenced ASTM
   standards.
2. Stone accessories and other manufactured products.

B. Shop Drawings: Include plans, sections, details, and attachments to other work.

C. Samples for Verification: For each stone type indicated, in sets of Samples not less than 12
   inches square. Include three or more Samples in each set and show the full range of variations
   in appearance characteristics expected in completed Work.

D. Qualification Data: For Installer or fabricator.

E. Sealant Compatibility Test Report: From sealant manufacturer, complying with requirements in
Section 079200 - JOINT SEALANTS and indicating that sealants will not stain or damage stone.
This includes sealants used to mount stone to substrate which could bleed through stone over
time.
F. Maintenance Data: For stone countertops to include in maintenance manuals. Include Product Data for stone-care products used or recommended by Installer, and names, addresses, and telephone numbers of local sources for products.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Fabricator of products.
B. Source Limitations for Stone: Obtain each variety of stone from a single quarry with resources to provide materials of consistent quality in appearance and physical properties.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
B. Store stone on wood A-frames or pallets with nonstaining separators and nonstaining, waterproof covers. Ventilate under covers to prevent condensation.

1.6 PROJECT CONDITIONS
A. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS
2.1 GRANITE
A. Granite: 3cm thick, type as selected by Architect. Comply with ASTM C 615.
B. Varieties and Sources: Provide Level 1 Granite: Santa Cecilia, Tan Brown, Ubatuba, or Golden Garnett as selected by the Architect.
C. Finish: Polished with eased edges.
D. General: Non-staining adhesives formulated for stone and recommended by their manufacturer for the application indicated.
E. Stone Cleaner: Cleaner specifically formulated for stone types, finishes, and applications indicated, as recommended by stone producer and, if a sealer is specified, by sealer manufacturer. Do not use cleaning compounds containing acids, caustics, harsh fillers, or abrasives.
F. Stone Sealer: Colorless, stain-resistant sealer that does not affect color or physical properties of stone surfaces, as recommended by stone producer for application indicated.

2.2 STONE FABRICATION, GENERAL
A. Select stone for intended use to prevent fabricated units from containing cracks, seams, and starts that could impair structural integrity or function.
B. Grade and mark stone for final locations to produce assembled countertop units with an overall uniform appearance.
C. Fabricate stone countertops in sizes and shapes required to comply with requirements indicated, including details on Drawings and Shop Drawings.

1. For granite, comply with recommendations in NBGQA's "Specifications for Architectural Granite."
2. Clean sawed backs of stones to remove rust stains and iron particles.
3. Dress joints straight and at right angle to face, unless otherwise indicated.
4. Cut and drill sinkages and holes in stone for anchors, supports, and attachments.
5. Provide openings, reveals, and similar features as needed to accommodate adjacent work.
6. Fabricate molded edges with machines having abrasive shaping wheels made to reverse contour of edge profile to produce uniform shape throughout entire length of edge and with precisely formed arris slightly eased to prevent snipping, and matched at joints between units. Form corners of molded edges as indicated with outside corners slightly eased, unless otherwise indicated.
7. Finish exposed faces of stone to comply with requirements indicated for finish of each type of stone required and to match approved Samples and mockups. Provide matching finish on exposed edges of countertops, splashes, and cutouts.

D. Carefully inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

2.3 STONE COUNTERTOPS

A. General: Comply with recommendations in MIA's "Dimension Stone - Design Manual."

B. Nominal Thickness: Provide thickness indicated, but not less than 1-1/4 inches. Gage backs to provide units of identical thickness.

C. Edge Detail: Straight, slightly eased at top.

D. Splashes: Provide 3/4-inch thick backsplashes and end splashes, unless otherwise indicated.

   1. Height: 4 inches.
   2. Top-Edge Detail: Straight, slightly eased at corner.

E. Joints: Fabricate countertops in sections for joining in field, with joints at locations indicated and as follows:


F. Cutouts and Holes:

   1. Undercounter Fixtures: Make cutouts for undercounter fixtures in shop using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

      a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.


   3. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates indicated to receive stone countertops and conditions under which stone countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

A. Advise installers of other work about specific requirements for placement of inserts and similar items to be used by stone countertop Installer for anchoring stone countertops. Furnish installers of other work with Drawings or templates showing locations of these items.

B. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives. Allow stone to dry before installing.

3.3 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/16 inch in 48 inches.

B. Variation from Level: Do not exceed 1/8 inch in 96 inches, 1/4 inch maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/4 of nominal joint width.

D. Variation in Plane at Joints (Lipping): Do not exceed 1/64-inch difference between planes of adjacent units.

E. Variation in Line of Edge at Joints (Lipping): Do not exceed 1/64-inch difference between edges of adjacent units, where edge line continues across joint.

3.4 INSTALLATION OF COUNTERTOPS

A. General: Install countertops by adhering to supports with water-cleanable epoxy adhesive.

B. Do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone. Cut lines straight, true, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.

C. Set stone to comply with requirements indicated on Drawings and Shop Drawings. Shim and adjust stone to locations indicated, with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances. Install anchors and other attachments indicated or necessary to secure stone countertops in place.

D. Space joints with 1/16-inch gap for filling with grout. Use temporary shims to ensure uniform spacing.

E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Use power saws with diamond blades to cut stone. 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.
F. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive and to countertops with stone adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.

G. Grout joints to comply with ANSI A108.10. Remove temporary shims before grouting. Tool grout uniformly and smoothly with plastic tool.

H. Apply sealant to joints and gaps specified for filling with sealant; comply with Section 079200 - JOINT SEALANTS. Remove temporary shims before applying sealant.

3.5 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean countertops as work progresses. Remove adhesive, grout, mortar, and sealant smears immediately.

B. Remove and replace stone countertops of the following description:
   1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Architect.
   2. Defective countertops.
   3. Defective joints, including misaligned joints.
   4. Interior stone countertops and joints not matching approved Samples and mockups.
   5. Interior stone countertops not complying with other requirements indicated.

C. Replace in a manner that results in stone countertops matching approved Samples and mockups, complying with other requirements, and showing no evidence of replacement.

D. Clean stone countertops not less than six days after completion of sealant installation, using clean water and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage stone.

E. Sealer Application: Apply stone sealer to comply with stone producer's and sealer manufacturer's written instructions.

END OF SECTION
SECTION 12 48 10
ENTRANCE FLOOR MATS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

   1. Surface mounted carpet-type matting.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of product indicated.

   1. Floor Mat: 12-inch- square sections of floor mat.

C. Maintenance Data: For floor mats to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain floor mats through one source from a single manufacturer.

B. Accessibility Requirements: Provide installed floor mats that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)" and the Massachusetts Architectural Access Board.

1.5 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 FLOOR MATS

A. Entrance Mat Tiles: Diagonal Tile by Mats Inc or equal.

   1. Material: 100% solution-dyed UV stabilized polypropylene fibers with post-consumer recycled content.

   2. Size: 11-9/16 inches square nominal, 3/8 inch thick.

   3. Installation Pattern: Quarter-turn tiles (parquet pattern).
4. Color: As selected by Architect from manufacturer's standard colors.
5. Warranty: Manufacturer's standard limited 3 year warranty.

B. Adhesives: Manufacturer's recommended water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate for compliance with requirements for proper installation of floor mats. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install mats in accordance with manufacturer's recommendations, approved submittals, and in proper relationship with adjacent construction. Coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

3.3 PROTECTION

A. Defer installation of floor mats until Project is near Substantial Completion.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes general administrative and procedural requirements for all work. The administrative and procedural requirements included in this Section are to expand the requirements specified in Division 1.

1.2 SCOPE OF WORK

A. Provide all labor, material, equipment, and services necessary for and incidental to completion of all work as indicated on the Drawings and/or as specified herein. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, sleeves, inserts, anchor bolts, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete and workable systems.

1.3 DRAWING USE AND INTERPRETATION

A. Unless indicated by specific dimensions, drawings are meant to be diagrammatic. Exact equipment locations and routing of utilities shall be governed by field conditions and/or Owner’s Representative’s instructions.

B. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as result of the failure to check or verify dimensions, measurements, etc., shall be corrected.

C. The drawings show the general arrangement of utilities, equipment, and accessories. Drawings do not indicate all offsets, fittings, accessories, and changes in elevation, which may be necessary. Make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in contract price. Provide offsets, fittings, and accessories as may be required to meet such conditions.

1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

a. The words “shall be” are implied where a colon (:) is used within a sentence or phrase.
1.5 DEFINITIONS

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

B. Indicated: The term “indicated” refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as “shown,” “noted,” “scheduled,” and “specified” are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as “directed,” “requested,” “authorized,” “selected,” “approved,” “required,” and “permitted” mean “directed by the Engineer,” “requested by the Engineer,” and similar phrases.

D. Approved: The term “approved,” where used in conjunction with the Engineer’s action on the Contractor’s submittals, applications, and requests, is limited to the Engineer’s duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term “Regulations” includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term “furnish” is used to mean “supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.”

G. Install: The term “install” is used to describe operations at project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”

H. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use.”

I. Installer: An “installer” is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
   1. The term “experienced,” when used with the term “installer,” means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
   2. Trades: Use of titles such as “carpentry” is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.
   3. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility of fulfilling Contract requirement remains with the Contractor.
      a. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

J. The term “concealed”: embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.
K. The term “exposed”: not installed underground or concealed. Equipment in rooms with exposed construction (i.e., mechanical rooms, electrical rooms, janitor’s closets, etc.) are classified as exposed.

L. The term “piping”: piping fittings, flanges, valves, controls, hangers, traps, drains, insulation and items necessary or required in connection with or relating thereto.

M. The “Project Site” is the space available to the contractor for performance of construction activities, either exclusively or in conjunction with other performing other work as part of the Project.

N. Testing Laboratories: A “testing laboratory” is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.6 COMPLETE SYSTEMS

A. General: Provide all materials as required for complete systems, including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation prior to Owner’s acceptance.

B. Systems: The systems specified and/or shown on the Drawings are for complete and workable systems. Any deviation from these systems due to a particular manufacturer’s requirements shall be made at no additional cost to the Owner.

1.7 CODES AND REGULATIONS

A. General: Comply with all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities. Contractor shall be required to contact state regulated “call before you dig” service prior to any excavation work.

C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.8 REFERENCE STANDARDS

A. All published standards of the following associations/organizations, as mandated by specific state standards, shall be followed and applied as a minimum:
   1. AABC, Associated Air Balance Council
   2. ACI, American Concrete Institute
   3. AGA, American Gas Assoc.
   4. AIA, The American Institute of Architects
   5. AISC, American Institute of Steel Construction
   6. ANSI, American National Standards Institute
   7. API, American Petroleum Institute
   8. ASME, American Society of Mechanical Engineers
   9. ASPE, American Society of Plumbing Engineers
   10. ASSE, American Society of Sanitary Engineering
11. ASTM, American Society for Testing and Materials
12. AWS, American Welding Society
13. AWWA, American Water Works Assoc.
14. CAGI, Compressed Air and Gas Institute
15. CGA, Compressed Gas Assoc.
16. CISPI, Cast Iron Soil Pipe Institute
17. DIPRA, Ductile Iron Pipe Research Assoc.
18. ETL, ETL SEMKO a Division of Intertek Group
19. FMG, Factory Mutual Global
20. HEI, Heat Exchange Institute
21. HI, Hydronics Institute
22. ISA, Instrument Society of America
23. MSS, Manufacturers Standardization Society
24. NACE, National Association of Corrosion Engineers International
25. NEC, National Electrical Code (from NFPA)
26. NEMA, National Electrical Manufacturers Assoc.
27. NFPA, National Fire Protection Assoc.
28. NSF, National Sanitation Foundation
29. PDI, Plumbing and Drainage Institute
30. SSPMA, Sump and Sewage Pump Manufacturers Assoc.
31. STI, Steel Tank Institute
32. SWPA, Submersible Wastewater Pump Assoc.
33. UL, Underwriters Laboratories Inc.
34. WSC, Water Systems Council

B. Federal Government Agencies: Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents:
1. EPA, Environmental Protection Agency.
2. NIST, National Institute of Standards and Technology (U.S. Department of Commerce).
3. OSHA, Occupational Safety and Health Administration (U.S. Department of Labor).

C. Applicability of Standards: Except where 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. Such standards are made a part of the Contract Documents by reference.

D. Copies of Standards: Each entity engaged in construction on the project is required to be familiar with industry standards applicable to that entity’s construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed for performance of a required construction activity, the contractor shall obtain copies directly from the publication source.

1.9 QUALITY ASSURANCE

A. Manufacturers’ Qualifications: Not less than 5 years of experience in the actual production of the specified products.
B. Installers’ Qualifications:
   1. Firm with not less than 5 years of experience in the installation of mechanical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.
   2. Painting, patching, carpentry and the like related to or required for Division 22 work shall be performed by craftsman skilled in the appropriate trade.
   3. All welding shall be performed by ASME certified welders.

1.10 INSPECTIONS

A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all work installed under this Contract in accordance with the Conditions of the Contract.

B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.

C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.

PART 2 – PRODUCTS

2.1 GENERAL

A. Where Specified: Materials and equipment shall be as specified in subsequent sections of the Project Manual and/or as indicated on the Drawings.

B. General: All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

C. Acceptable Products: The product will be acceptable only when that product complies with all requirements of the Contract Documents as determined by the Engineer.

D. Common Items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.

E. Listing: All materials and equipment shall be Underwriters’ Laboratories (UL) or ETL SEMKO (ETL) listed and labeled, where UL or ETL standards and listings exist for the specified materials or equipment.

F. Special Tools: Provide all special tools needed for proper operation, adjustment and maintenance of equipment.

PART 3 – EXECUTION

3.1 GENERAL

A. The installation of all mechanical work shall be in accordance with the letter and intent of the Contract Documents, as determined by the Engineer.
B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty, UL or ETL listing.

3.2 DELIVERY STORAGE AND HANDLING

A. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer’s identification, and compliance labels.

B. Storage and Protection: Comply with all manufacturer’s written recommendations. Protect all equipment, materials and work from the weather elements, paint, mortar, construction debris and damage throughout duration of project.

C. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

3.3 EXAMINATION

A. Conditions Verification: Examine the areas and conditions under which the work is to be performed. Identify and report any conditions detrimental to the proper and timely completion of the work to the Owner’s Representative.

3.4 DIMENSIONS

A. Building Dimensions: Exact locations of building elements shall be based on Contractor’s field measurements.

B. Limiting Dimensions: Where equipment dimension and clearances are indicated on the Drawings, do not provide equipment larger than equipment dimensions or clearances specified.

C. Verify all dimensions by field measurements.

3.5 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.6 CUTTING AND PATCHING

A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting and patching of mechanical equipment and materials required to:
   1. Uncover Work to provide for installation of non-coordinated and/or improperly installed work.
   2. Remove and replace defective Work.
   3. Remove and replace Work not conforming to requirements of the Contract Documents.
   4. Remove samples of installed Work as specified for testing.
   5. Install equipment and materials in existing structures.
   6. Uncover and restore Work to provide for Engineer observation of concealed Work.

C. Cut, remove, and legally dispose of equipment, components, and materials as indicated. Removal shall include all ancillary items associated with items removed. Remove all items made obsolete by the new work.
D. Protect the structure, furnishings, finishes, and adjacent materials not indicated to be removed.

E. Provide and maintain temporary dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

F. Patch surfaces and building components using new materials matching existing adjacent materials.

3.7 ADMINISTRATION AND SUPERVISION

A. The Contractor shall supervise the work and shall have at all times some competent person, approved by the Owner, following the work to receive instructions and to act with authority.

3.8 TESTING AND ADJUSTING

A. General: Provide testing equipment, materials, instruments, and personnel to perform all test procedures and adjustments required by other Division 22 Sections and/or deemed necessary by the Engineer to establish proper performance and installation of systems and equipment. All test instruments to be accurately calibrated and in good working order.

B. Scheduling: Schedule tests at least three days in advance, and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational, unless indicated or directed otherwise.

C. Correction/Replacement: After testing, correct any deficiencies, and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken, and satisfactory results of retest.

3.9 SYSTEMS DEMONSTRATION

A. Instruct the Owner’s representative(s) in the start-up, operation and maintenance of all systems and equipment in accordance with the Contract Documents.

3.10 CLEANING

A. General: Remove from the project site, all waste, rubbish, and construction debris weekly unless indicated otherwise. The premises shall be left clean and free of any debris and unused construction materials, prior to final acceptance.

B. Equipment: Remove all dust, dirt, debris, mortar, rust, and other foreign materials from the interior and exterior of all equipment and enclosures and wipe down.

C. Utilities: Thoroughly clean all utilities, just prior to final inspection.

3.11 TOUCH-UP PAINTING

A. Touch-Up Painting: Restore and refinish to original condition, all surfaces of equipment scratched, marred and/or dented during shipping, handling, or installation. Remove all rust, and prime and paint as recommended by the manufacturer.

END OF SECTION
PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the coordination and procedural requirements for Contractors.

B. Definitions:
   1. Owners Representative - Architect, Engineer, Construction Manager, General Contractor, Clerk of the works or any stipulated Agent or Representative of the Owner.
   2. GC - General Contractor.
   3. MC - Mechanical Contractor/Subcontractor.
   4. PC - Plumbing Contractor/Subcontractor.
   5. EC - Electrical Contractor/Subcontractor.
   6. SM - Sheet Metal Subcontractor.
   7. SC - Sprinkler Contractor/Subcontractor.

1.2 COMPLIANCE

A. Cost incurred including those of other contractors and/or Owner, due to non-compliance with this Section shall be the responsibility of the non-compliant contractor.

1.3 SUBMITTALS

A. Complete coordinated shop drawing shall be submitted in PDF format to the Engineer for their record by the MC. Submitted coordinated shop drawing shall include all signatures required by sign off procedure.

PART 2 – PRODUCTS – NOT APPLICABLE

PART 3 – EXECUTION

3.1 COORDINATION

A. General: Sequence, coordinate and integrate the installation of all materials and equipment for efficient flow of work, in conjunction with the other trades. Review and become familiar with all of the Drawings and work of all the other trades. Report and resolve any discovered discrepancies and/or interferences prior to commencing work.

B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work.

C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the work.

D. Supports and Sleeves: Coordinate the location installation of required supporting devices and sleeves to be set in concrete and other structural components, as they are constructed.
E. Right-Of-Way:
1. Adjust location of utilities, equipment, etc., to accommodate the work to prevent interferences, both anticipated and encountered.
2. Determine the exact route and location prior to fabrication.
3. Pitched piping has the right-of-way over utilities which do not pitch.
4. Furnish and install ancillary materials and equipment including but not limited to traps, air vents, drains, etc., as required to accommodate offsets, transitions, and changes in direction.

F. Headroom: Install systems, materials, and equipment to maximize headroom unless noted otherwise.

G. Utility Connections: Coordinate connection with underground and overhead utility services. Comply with requirements of governing regulations, utility providers, and controlling agencies. Provide required connection for each service.

3.2 COORDINATED SHOP DRAWINGS

A. The coordination shop drawing process shall occur in the following manner:
1. The MC shall create 3/8-inch scale AutoCAD (2010 or newer) base plans, which shall incorporate and coordinate with structural steel and ceiling system framing supports and show framing members on the shop drawings. This shall include existing building components not shown on Contract Documents.
2. The MC shall require the Sheet Metal Subcontractor to submit AutoCAD shop drawings, as expeditiously as possible, to the Engineer (through normal channels) for review and approval. The shop drawings shall incorporate all ductwork (including top and bottom of duct elevations at a maximum interval of 25 linear feet and at each elevation change), structural steel (building and misc. support steel), equipment and accessories as shown and/or specified in the contract documents.
3. All roof penetrations, wall and floor openings shall be coordinated with the structural steel Subcontractor, Supplier and/or Erector, through the Owner’s Representative. All conflicts with structural steel members shall be resolved through the Owner’s Representative.
4. After review and final approval of the sheet metal shop drawing by the Engineer, the sheet metal Subcontractor shall incorporate all required corrections, additions and modifications on the AutoCAD ductwork shop drawings.
5. The approved AutoCAD ductwork shop drawings shall be utilized for coordination with all other Contractors or Subcontractors whose involvement is mandated. The SM shall submit the AutoCAD ductwork shop drawings (hard copy and electronic files) to the MC to initiate the “coordination” process. The MC shall review the drawings for accuracy and completeness prior to distribution.
6. The MC shall forward, with transmittal, the ductwork shop drawings (hard copy and electronic files) to the PC for coordination of the plumbing work. The MC shall forward a copy of the transmittal to the Owner’s Representative.
7. The PC shall (upon receipt of drawings from the MC) superimpose his scope of work on the AutoCAD ductwork shop drawings illustrating all plumbing equipment, piping and hangers.
8. The PC shall include invert of pipes; elevations (top and bottom) and pipe sizes including insulation at a maximum of 25-foot intervals and at each elevation change.
9. Any conflicts between the plumbing and ductwork shall be clouded by the PC on the AutoCAD ductwork shop drawing file.
10. PC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. PC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the plumbing and ductwork shall be resolved through and by the Owner’s Representative.
11. The PC and/or the SM shall correct and shall complete the AutoCAD drawings depicting all resolutions.

12. When it is ascertained that no conflicts exist between the ductwork and plumbing work, the PC shall forward the final ductwork/plumbing coordinated drawings (hard copy and electronic files) to the MC with transmittal, and provide the Owner’s Representative with a copy of the transmittal.

13. The MC shall (upon receipt of drawings from the PC) superimpose all heating and air conditioning piping, equipment, hangers, and insulation, including elevations (top and bottom) and pipe sizes (including insulation), on the AutoCAD drawings.

14. Any conflicts between the ductwork/plumbing/mechanical work shall be clouded by the MC on the AutoCAD shop drawing file.

15. MC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. MC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the MC, SM and PC shall be resolved through and by the Owner’s Representative.

16. The MC, PC and SM shall correct and complete the AutoCAD drawings depicting all resolutions.

17. When it is ascertained that no conflicts exist between the MC, SM and PC, the MC shall forward the final ductwork/plumbing/mechanical coordinated drawings (hard copy and electronic files) to the EC with transmittal, and provide the Owner’s Representative with a copy of the transmittal.

18. The EC shall (upon receipt of drawings from the MC) superimpose all electrical equipment including but not limited to light fixtures, conduit and hangers on the AutoCAD drawings.

19. The EC shall include elevations of light fixtures, electrical conduit and conduit sizes.

20. Any conflicts with the ductwork/plumbing/mechanical/electrical work shall be clouded by the EC on the AutoCAD shop drawing file.

21. EC shall request coordination meeting to resolve any conflicts as clouded on the coordinated shop drawings. EC shall provide clouded coordinated shop drawing at the coordination meeting. All conflicts that arise between the EC, MC, PC and SM shall be resolved through and by the Owner’s Representative.

22. The EC and/or the SM, PC, MC shall correct and complete the AutoCAD drawings depicting all resolutions.

23. When it is ascertained that no conflicts exist between the EC, MC, PC and SM, the EC shall forward the final ductwork/plumbing/mechanical/electrical coordinated drawings (hard copy and electronic file) to the SC with transmittal, and provide the Owner’s Representative with a copy of the transmittal.

24. The SC shall (upon receipt of drawings from the EC) superimpose all sprinkler equipment, piping, hangers and sprinkler heads as required by the contract documents and the appropriate codes.

25. The SC shall include elevations of piping and piping sizes.

26. Any conflicts with the ductwork/plumbing/mechanical/electrical/sprinkler work shall be clouded by the SC on the AutoCAD shop drawings.

27. The SC shall request coordination meeting to resolve any conflicts as clouded on the coordinated shop drawings. SC shall provide clouded coordinated shop drawing at the coordination meeting. All conflicts that arise between the SC, EC, MC, PC, and/or SM shall be resolved through and by the Owner’s Representative.

28. The SC and/or EC, MC, PC, SM shall complete the AutoCAD drawings depicting all resolutions.

29. When it is ascertained that no conflicts exist between the SC, EC, MC, PC, and SM, the SC shall forward the final ductwork/plumbing/mechanical/electrical/sprinkler coordination
drawing to the MC with transmittal, and provide the Owner’s Representative with a copy of the transmittal.

30. Sign Off:
   a. The MC shall provide the final coordinated shop drawing to the Engineer and the Owner’s Representative. The final coordinated shop drawing shall contain signatures from SM, PC, MC, EC, and SC on each sheet.
   b. Upon completion of the coordination process by all Contractors and Subcontractors as described above, they shall sign off on all drawings in ink indicating company, name, date of sign-off and signature of company representative.
   c. Each contractor signature shall certify that each Contractor has shown their respective work on the drawings and have resolved all points of conflict and interference with other Contractors and Subcontractors.

3.3 COORDINATION MEETINGS

A. During the coordination process, separate meetings apart from project meetings concerning the progress and schedules may be called by the Owner’s Representative when required or at the request of one or more of the coordinating Contractors:
   1. The Owner’s Representative shall contact the Contractors and make all required arrangements (e.g., time, place, etc.).
   2. All Contractors shall place emphasis and importance on equipment purchases, so as to not delay approvals, shop drawings and the coordinated drawings.

3.4 SCHEDULE OF COORDINATED SHOP DRAWINGS

A. The MC and SM shall complete the ductwork shop drawings within 2 weeks after award of contract (or authorization to proceed).

B. Turn-around time for each Contractor shall be 2 weeks maximum.

3.5 "AS-BUILT" DRAWINGS

A. At the completion of the project, “As-Built” corrections shall be made to each AutoCAD drawing by each of the aforementioned Contractors and returned to the Owner’s Representative for the Owner’s permanent files and records. These “As-Buils” do not remove the obligation of “As-Buils” and record drawings as outlined under other sections of the specifications unless the Owner’s Representative elects to do so.

END OF SECTION
SECTION 22 05 00
BASIC PLUMBING MATERIALS AND METHODS

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following basic materials and methods to complement other Division 22 Sections:
   1. Piping installation instructions common to most piping systems.
   2. Dielectric fittings.
   3. Flexible connectors.
   4. Mechanical sleeve seals.
   5. Sleeves.
   7. Fire Stopping.
   8. Identifying devices and labels.
   10. Interior concrete housekeeping pads.
   11. Installation requirements common to equipment specification sections.
   12. Touch-up painting.
   13. Removals.

B. Pipe, pipe fittings, and joining materials and methods are specified in Division 22 piping system sections.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. Existing: Condition present prior to award of this Contract.
1.3 SUBMITTALS

A. Product Data: For all materials specified within this section.

B. Fire Rated Penetration Listing Details: Submit Underwriters Laboratory penetration listing details specific to the penetrations required by the project along with fire stopping material data.

C. Quality Control Submittals: Fire stopping certificates specified in Quality Assurance below.

1.4 QUALITY ASSURANCE

A. Fire Stopping: Fire stopping installer shall be certified by the fire stopping manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Protect piping, flanges, fittings, and piping specialties to prevent pipe end damage. Maintain end caps through shipping, storage, and handling.

B. Protect all stored materials from moisture and dirt. Elevate above grade and support to prevent sagging and bending. Do not exceed structural capacity of floor, if stored inside.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where identifying devices are to be applied.

B. Install identifying devices before concealment.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Dielectric Components:
   a. Watts Water Technologies, Inc.
   b. Grinnell Corp.; Grinnell Supply Sales Co.
   c. Victaulic Co. of America.

2. Metal, Flexible Connectors:
   a. Engineered Flexible Products.
   b. Flexicraft Industries.
   c. Grinnell Corp.; Grinnell Supply Sales Co.
   d. Mercer Rubber Co.
   e. Metraflex Co.

3. Mechanical Sleeve Seals:
   a. Calpico, Inc.
   b. Metraflex Co.
   c. Proco Products, Inc.
   d. Thunderline/Link-Seal.

4. Fire-Stopping Sealant:
a. Dow Corning Corp.
b. 3M Corp.
c. Hilti Corp.

5. Pipe Escutcheons:
   c. Grinnell.

6. Identifying Devices:
   b. Seton Identification Products.
   c. W.H. Brady Company.

2.2 DIELECTRIC FITTINGS

A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.

B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.

C. Insulating Material: Suitable for system fluid, pressure, and temperature.

D. Dielectric-Flange Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers. Dielectric flange kit materials shall be compatible with system fluid, temperature and pressure.

E. Dielectric Couplings: ARE NOT ALLOWED.

F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; and 300-psig (2070-kPa) minimum working pressure at 225 DegF (107 DegC). Coordinate end selection with piping system specifications.

2.3 FLEXIBLE CONNECTORS

A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125-psig (860-kPa) minimum working-pressure rating at 220 DegF unless higher working pressure or temperature is indicated. Coordinate end selection with piping system specifications.

B. Stainless-Steel-Hose/Stainless-Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include stainless-steel nipples or flanges, welded to hose.

2.4 MECHANICAL SLEEVE SEALS

A. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with stainless steel bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical isolation.
2.5 SLEEVES

A. General: The following materials are for wall, floor, slab, and roof penetrations.

B. Pipe:
   1. Steel Sheet Metal: 0.0359-inch (0.9-mm) minimum thickness, galvanized, round tube closed with welded longitudinal joint.
   3. Cast Iron: Cast or fabricated pipe equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop.
   4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
      a. Underdeck Clamp: Clamping ring with set screws.

C. Ductwork:
   1. All sleeves shall be per SMACNA.

2.6 ESCUTCHEONS

A. General: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
   1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
   2. OD: Completely cover opening.
   3. Stamped Steel: One piece, with set screw and chrome-plated finish.

2.7 FIRE STOPPING

A. UL listed material specific to the UL penetration listing detail.

2.8 IDENTIFYING DEVICES AND LABELS

A. Equipment Nameplates: Metal nameplate with operational data engraved or die-stamped; permanently fastened to equipment:
   1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

B. Stick-on Pipe Markers: Manufacturer’s standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl, complying with ASME A13.1.


D. Rigid Pipe Markers: Manufacturer’s standard preprinted, color coded, rigid plastic with flow arrows and fluid medium designed to be applied to piping systems without the need of adhesives. For markers up to 6 inches, markers shall wrap completely around the pipe, and their own tension shall secure them in place. For markers over 6 inches, markers shall be provided with nylon ties to secure marker to piping system Markers comply with ANSI/ASME A13.1.

E. Valve Tags: Stamped or engraved 0.032-inch (0.8-mm-) thick, polished brass, 1-1/2-inches (40-mm) diameter, with 1/4-inch (6-mm) piping system abbreviation letters and 1/2-inch (13-mm)
sequenced numbers. Include 5/32-inch (4-mm) hole and brass, wire-link or beaded chain; or brass S-hook fastener.

F. Framed Valve Schedule: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include appropriate mounting hardware. Valve schedule shall be 8-1/2 inches by 11 inches with a minimum font height of 12 point. Frame shall be extruded aluminum with ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass. Schedule shall include valve number, piping system, system abbreviation as shown on valve tag, location of valve (room or space), normal operating position (open, closed or modulating). Indicate valves utilized for emergency shut off or other special purposes.

G. Access Panel Markers: 1/16-inch (2-mm) thick, engraved plastic-laminate markers, with abbreviated terms and numbers corresponding to concealed valve. Provide 1/8-inch (3-mm) center hole for attachment.

H. Plastic Equipment Markers: ASME A13.1, color-coded, laminated plastic. Include lettering identifying name, equipment service, design capacity, pressure drop, entering and leaving conditions and RPM indicated on the contract documents. Size shall be 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; and 4-1/2 by 6 inches (115 by 150 mm) for equipment. Identifying names and/or abbreviations shall match those indicated on the contract documents.

2.9 GROUT

A. Non-shrink, Non-metallic Grout: ASTM C1107, Grade B, post-hardening, volume-adjusting, dry, non-staining, non-corrosive, non-gaseous, hydraulic-cement grout recommended for interior and exterior applications. Design mix shall be 5000-psig (34.5-MPa), 28-day compressive strength.

2.10 INTERIOR CONCRETE HOUSEKEEPING PADS

A. General: Coordinate pad sizing with equipment footprint.

B. Concrete: 3000-psig (20.7-MPa), 28-day compressive-strength concrete.

C. Form work: 14-gauge galvanized steel frame.

D. Dowels: No. 4 rebar.

E. Reinforcement: 6 by 6 – W2.9 by W2.9 wire metal mesh at center.

F. Thickness: As indicated on the plans.

PART 3 – EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General: Install piping as described below, unless piping sections specify otherwise.

B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.

C. Install components with pressure and temperature ratings equal to or greater than system operating pressure and temperature.
D. Install piping free of sags and bends. Install fittings for changes in direction and branch connections. Install fittings, couplings, and accessories according to manufacturer’s written instructions.

E. Install piping at parallel and perpendicular to building walls. Diagonal runs are prohibited, unless otherwise indicated. Locate groups of pipes parallel to each other, spaced to permit valve servicing.

F. In areas of exposed piping, install piping to maximize headroom. In areas with ceilings, install piping to maximize clearance between ceiling and pipe. Allow sufficient space for ceiling panel removal.

G. Install piping to allow application of insulation plus 1-inch (25-mm) clearance around insulation.

H. Install pipe escutcheons for pipe penetrations of walls, partitions, floors, and ceilings.

I. Install drains at low points in mains, risers, and branch lines consisting of a tee fitting, 3/4-inch ball valve, threaded nipple and chained cap.

J. Install line size manual shutoff valve at each connection to each piece of equipment.

K. Install piping so that accessories are accessible for operation, maintenance, repair, and replacement.

L. Install piping with sufficient clearance to allow for expansion and contraction.

M. Sleeves are not required for core drilled holes through interior solid concrete walls and floors, above grade exterior solid concrete walls and existing underground solid concrete walls. Floors in mechanical equipment areas or other wet areas shall be provided with a sleeve with waterstop.

N. Install sleeves for pipes passing through walls, partitions, and slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level. In floors with water stop extend cast-iron sleeve fittings below floor slab as required to secure clamping ring.
   2. Build sleeves into new walls and slabs as walls and slabs are being constructed.
   3. Install sleeves in non-fired rated assemblies large enough to provide 1/2-inch (12.7-mm) annular clear space between sleeve and pipe or pipe insulation.
   4. Install sleeves in fire rated assemblies per ASTM E814 by Underwriters Laboratory, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.

O. Interior Wall and Floor Pipe Penetrations: Sleeves shall be steel pipe except steel sheet metal shall be used for gypsum wall penetrations.

P. Water Proof Floor and Roof Pipe Penetrations: For pipes penetrating floors and roofs with membrane waterproofing install stack sleeve fitting. Secure flashing between clamping flanges. Seal space outside of sleeve fittings with non-shrink, non-metallic grout. Provide Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant between sleeve and pipe.

Q. Aboveground, Exterior-Wall, Pipe Penetrations:
   2. Non-Masonry or Non-Concrete Walls: Provide wall plate matching surrounding construction. Fill gap between wall opening and pipe with mineral wool. Provide Type S, Grade NS, Class 25; use O, neutral-curing silicone sealant between wall plate and wall.
R. Underground, Exterior-Wall, Pipe Penetrations: Provide cast-iron or galvanized steel sleeves with integral watertop, except for existing walls. Seal pipe penetrations using mechanical sleeve seals. Size sleeve for annular clear space between pipe and sleeve for installing mechanical sleeve seals. Annular clear space shall be per mechanical sleeve seal manufacturer’s written recommendation. Assemble and install mechanical sleeve seals according to manufacturer’s written instructions.

S. Verify final equipment locations for roughing-in.

T. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification sections:
   1. Threaded Steel Pipe Joints: Thread pipe with tapered pipe threads in accordance with ANSI B2.1 and ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint lubricant or sealant suitable for the service for which the pipe is intended on the male threads at each joint and tighten joint to leave not more than 3 threads exposed. Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
   3. Copper Pipe Joints: Thoroughly clean tube surface and inside surface of the cup of the fittings, using very fine emery cloth, prior to making soldered or brazed joints. Wipe tube and fittings clean and apply flux. Flux shall not be used as the sole means for cleaning tube and fitting surfaces.
   4. Gasket Materials: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned.
   5. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
   6. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:
   1. Remake leaking joints using new materials.
   2. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
   3. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.2 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components, unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting and without interference(s) to other installations.

D. Extend grease fittings to accessible locations.
3.3 FIRE STOPPING

A. Fire Stopping: At penetrations through fire rated walls, partitions, barriers, ceilings, roofs or floors, the fire rated integrity shall be maintained. Provide manufacturer’s standard fire-stopping sealant, with accessory materials, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E814 by Underwriters Laboratory, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.

3.4 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on all piping of each system (insulated and un-insulated), including pipe sizes, fluid medium and direction of flow arrows.

B. Interior, non-metal jacketed piping systems: Provide stick-on markers. Install flow marker 360 degrees at each end of each pipe marker.
   1. Interior metal jacketed and exterior piping systems: Provide rigid markers (for markers on piping over 6 inches provide nylon ties). Provide stick-on size marker attached to rigid marker.
   2. Markers shall be spaced at a maximum of 25-foot (7.5-m) intervals along each run. In addition to the 25-foot intervals, provide markers at the following locations:
      a. Near each valve and control device.
      b. Near each branch, excluding short takeoffs for fixtures and terminal units.
      c. Near locations where pipes pass through walls, floors, ceilings, or enter non-accessible enclosures.
      d. At access doors, manholes, and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.

C. Valve Tags:
   1. Install on all valves and control devices (factory and field installed), except check valves, plumbing fixture supply stops, faucets, and hose connections. List tagged valves in valve schedule.
   2. Provide framed valve schedule(s) where directed by Owner’s representative.

D. Install plastic equipment marker on all equipment provided under this Contract.

E. Provide additional mechanical identification materials and devices to supplement field or factory supplied nameplates that have become visually blocked by work of this or other Divisions.

F. Clean faces of identification devices and glass frames of valve charts.

3.5 TOUCH-UP PAINTING

A. Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.6 GROUTING

A. Install nonmetallic, non-shrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix and cure grout according to manufacturer’s written instructions.

B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout to provide smooth bearing surface for equipment base.

F. Place grout, completely filling equipment bases.

G. Place grout around anchors.

3.7 INTERIOR CONCRETE HOUSEKEEPING PADs

A. Provide concrete housekeeping pads for all floor mounted equipment. Provide 6 inches tall 3000 psi concrete pad having 6 by 6 – W2.9 by W2.9 wire metal mesh at center. Extend pad a minimum of 4 inches greater than equipment footprint in all directions. Provide a smooth trowel finish on top surface of pad.

B. Provide 14-gauge galvanized steel frame around entire perimeter of pad having a 3/4-inch chamfer at all corners and at all edges. Frame to extend 1/2 inch over top of pad and 1 inch beneath bottom surface of pad. All corners to be welded.

C. Anchor pad to existing or new concrete floor with No. 4 rebar dowels set at a minimum 12 inches on center in each direction, having the last 2 inches of dowel bent at a 90-degree angle.
   1. Existing floors: Drill 1-inch diameter bores into the existing concrete floor at a minimum depth of 2 inches to accept dowels. Fasten dowels within bores with epoxy grout.
   2. Newly poured floors: Provide rebar dowels embedded to a depth of 2 inches below floor surface, having the last 2 inches of dowel bent at a 90-degree angle.

D. Prior to pouring concrete pad, place manufacture’s recommended galvanized steel anchor bolts into pad using the equipment template provided.

E. Provide 5000 psi level grout bedding beneath equipment prior to setting and final tightening of fasteners.

3.8 REMOVALS

A. Disconnect and remove work where indicated on the contract documents in its entirety.

B. Removal: Remove indicated equipment, piping, ductwork, insulation and associated components from Project site and dispose of in a legal manner. Provide Owner’s right of first refusal for all equipment removed.

C. Where work is indicated to be abandoned in place, cut and remove pipe or ductwork a minimum of 2 inches (50 mm) beyond the wall, floor, ceiling or roof. Patch surface to match existing finish of adjacent construction.

D. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.
3.9 REPAIRS

A. If existing or new work is damaged or disturbed, remove damaged sections and install new products of equal capacity and quality.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following types of meters and gages:
   1. Temperature gages and fittings.
   2. Pressure gages and fittings.

1.2 SUBMITTALS

A. Product data for each type of meter and gage. Include scale range, ratings, and calibrated performance curves, certified where indicated. Submit meter and gage schedule showing manufacturer’s figure number, scale range, location, and accessories for each meter and gage.

B. Product certificates signed by manufacturers of meters and gages certifying accuracies under specified operating conditions and products' compliance with specified requirements.

C. Maintenance data for each type of meter and gage.

1.3 QUALITY ASSURANCE

A. UL Compliance: Comply with applicable UL standards pertaining to meters and gages.

B. ASME and ISA Compliance: Comply with applicable portions of ASME and Instrument Society of America (ISA) standards pertaining to construction and installation of meters and gages.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Direct-Mount Filled-System Dial Thermometers:
   3. Trerice (H.O.) Co.
   4. Weiss Instruments, Inc.
   5. Weksler Instruments Corp.

B. Bimetal Dial Thermometers:
   2. Marshalltown Instruments, Inc.
   3. Tel-Tru Manufacturing Co., Inc.
   4. Trerice (H.O.) Co.
   5. Weiss Instruments, Inc.
   6. Weksler Instruments Corp.

C. Thermometer Wells: Same as for thermometers.
D. Insertion Dial Thermometers:
   2. Tel-Tru Manufacturing Co., Inc.
   3. Trerice (H.O.) Co.
   4. Weiss Instruments, Inc.
   5. Weksler Instruments Corp.

E. Pressure Gages:
   4. Marshalltown Instruments, Inc.
   5. Trerice (H.O.) Co.
   6. Weiss Instruments, Inc.
   7. Weksler Instruments Corp.
   8. WIKA Instruments Corp.

F. Pressure Gage Accessories: Same as for pressure gages.

G. Test Plugs:
   1. MG Piping Products Co.
   2. Peterson Equipment Co., Inc.
   4. Trerice (H.O.) Co.
   5. Watts Regulator Co.

2.2 THERMOMETERS, GENERAL

A. Accuracy: Plus or minus 1 percent of range span or plus or minus one scale division to maximum of 1.5 percent of range span

B. Scale range: Temperature ranges for services listed as follows:
   1. General: Temperature range shall be selected such that normal operating temperature is at 75 percent of scale.
   2. Domestic Hot Water: 30 to 240 DegF with 2-degree scale divisions (0 to 115 DegC with 1-degree scale divisions).
   3. Domestic Cold Water: 0 to 100 DegF with 2-degree scale divisions (minus 18 to 38 DegC with 1-degree scale divisions).

2.3 DIRECT-MOUNT FILLED-SYSTEM DIAL THERMOMETERS

A. Type: Vapor actuated, universal angle.

B. Case: Drawn steel or cast aluminum, glass lens, 4-1/2-inch diameter.

C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Thermal Bulb: Copper with phosphor bronze bourdon pressure tube.
E. Movement: Brass, precision geared.

F. Scale: Progressive, satin faced, non-reflective aluminum, permanently etched markings.

G. Stem: Copper-plated steel, aluminum, or brass, for separable socket, length to suit installation.

2.4 BIMETAL DIAL THERMOMETERS

A. Type: Direct mounted, bimetal, universal angle.

B. Case: Stainless steel, glass lens, 5-inch diameter.

C. Adjustable Joint: Finish to match case, 180-degree adjustment in vertical plane, 360-degree adjustment in horizontal plane, with locking device.

D. Element: Bimetal coil.

E. Scale: Satin faced, non-reflective aluminum, permanently etched marking.

F. Stem: Stainless steel for separable socket, length to suit installation.

2.5 DIAL-TYPE INSERTION THERMOMETERS

A. Type: Bimetal, stainless steel case and stem, 1-inch-diameter dial, dust- and leakproof, 1/8-inch-diameter tapered-end stem with nominal length of 5 inches.

2.6 THERMOMETER WELLS

A. Thermometer Wells: Brass or stainless steel, pressure rated to match piping system design pressure; with 2-inch extension for insulated piping and threaded cap nut with chain permanently fastened to well and cap.

2.7 PRESSURE GAGES

A. Type: General use, ASME B40.1, Grade A, phosphor bronze bourdon- tube type, bottom connection.

B. Case: Drawn steel or brass, glass lens, 4-1/2-inches diameter.

C. Connector: Brass, 1/4-inch NPS.

D. Scale: White coated aluminum, with permanently etched markings.

E. Accuracy: Plus or minus 1 percent of range span.

F. Range: Conform to the following:
   1. All fluids: Two (2) times operating pressure.

2.8 PRESSURE GAGE ACCESSORIES

A. Syphon: 1/4-inch NPS straight coil constructed of brass tubing with threads on each end.

B. Snubber: 1/4-inch NPS brass bushing with corrosion-resistant porous metal disc. Disc material shall be suitable for fluid served and rated pressure.
2.9 TEST PLUGS

A. Test Plugs shall be nickel-plated brass body, with 1/2-inch NPS fitting and two (2) self-sealing valve-type core inserts, suitable for inserting a 1/8-inch O.D. probe assembly from a dial-type thermometer or pressure gage. Test plug shall have gasketed and threaded cap with retention chain and body of length to extend beyond insulation. Pressure rating shall be 500 psig.

B. Core Material: Conform to the following for fluid and temperature range:
   1. Water and Gas: 20 to 200 DegF (minus 7 to 93 DegC): Neoprene.
   2. Water: minus 30 to 275 DegF (minus 35 to 136 DegC): EPDM.

C. Test Kit: Provide test kit consisting of one (1) pressure gage, gage adapter with probe, two (2) bimetal dial thermometers, and carrying case.

D. Ranges of pressure gage and thermometers shall be approximately two (2) times systems operating conditions.

PART 3 – EXECUTION

3.1 THERMOMETERS INSTALLATION

A. Install thermometers in vertical and tilted positions to allow reading by observer standing on floor.

B. Install in the following locations and elsewhere as indicated:
   1. At inlet and outlet of each thermal storage tank.

C. Thermometer Wells: Install in piping tee where thermometers are indicated, in vertical position. Fill well with oil or graphite and secure cap.

3.2 INSTALLATION OF PRESSURE GAGES

A. Install pressure gages in piping tee with pressure gage valve, located on pipe at most readable position.

B. Install in the following locations, and elsewhere as indicated:
   1. At suction and discharge of each pump.
   2. At discharge of each pressure-reducing valve.
   3. At building water service entrance.

C. Pressure Gage Needle Valves: Install in piping tee with snubber. Install syphon in lieu of snubber for steam pressure gages.

3.3 INSTALLATION OF TEST PLUGS

A. Test Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.

3.4 ADJUSTING AND CLEANING

A. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.
B. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked and broken windows, and repair scratched and marred surfaces with manufacturer’s touch-up paint.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other sections. The drawings indicate the general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install meters and gages piping adjacent to machine to allow servicing and maintaining of machine.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Section includes: This section includes general duty valves common to most plumbing piping systems. Special purpose valves are specified in individual piping system specifications.

1.2 SUBMITTALS

A. Product Data: Product data, including body material, valve design, pressure and temperature classification, end connection details, seating materials, trim material and arrangement, dimensions and required clearances.

B. Valve Schedule: Valve schedule indicating manufacturer’s figure number, size, location, and valve features for each required valve, and installation instructions.

1.3 QUALITY ASSURANCE

A. American Society of Mechanical Engineers (ASME) Compliance: Comply with ASME B31.9 for building services piping and ASME B31.1 for power piping.

B. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the various MSS Standard Practices referenced.

C. Low Lead Content: All valves submitted for use in potable water systems shall meet NSF/ANSI 372 Standard for Low Lead Content.

1.4 STORAGE AND HANDLING

A. Storage: Use the following precautions during storage:
   1. Do not remove valve end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect valves from weather. Store valves indoors. Maintain valve temperature higher than the ambient dew point temperature. If outdoor storage is necessary, support valves off the ground or pavement in watertight enclosures.

B. Handling: Use a sling to handle valves whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels and stems as lifting or rigging points.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products from one of the manufacturers listed in valve schedule.

B. Provide valves of same manufacturer throughout where possible. Manufacturer’s name, valve size, and pressure rating shall be clearly marked on outside of body.
2.2 VALVE FEATURES, GENERAL

A. Valve Design: Rising stem or rising outside screw and yoke stems.
   1. Non-rising stem valves may be used where headroom prevents full extension of rising stems.

B. Pressure and Temperature Ratings: As scheduled and required to suit system pressures and temperatures.

C. Sizes: Same size as upstream pipe unless otherwise indicated.

D. Operators: Provide the following special operator features:
   1. Handwheels, fastened to valve stem, for valves other than quarter turn.
   2. Lever handles, on quarter-turn valves 6 inches and smaller, except for plug valves. Provide plug valves with square heads; provide one wrench for every 10 plug valves.

E. Extended Stems: Where insulation is indicated or specified, provide extended stems arranged to receive insulation.

F. Bypass and Drain Connections: Comply with MSS SP-45 bypass and drain connections.

G. End Connections: As indicated in the valve specifications:
   2. Solder-Joint: Comply with ANSI B16.18:
      a. Caution: Where soldered end connections are used, use solder having a melting point below 840 DegF for gate, globe, and check valves – below 421 DegF for ball valves.

H. All valves submitted for use in potable water systems use shall meet NSF/ANSI 372 Standard for Low Lead Content.

2.3 GATE VALVES

A. Gate Valves, 3 Inches and Smaller: MSS SP-80; Class 125, body and bonnet of ASTM B62 cast bronze, with threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, “Teflon” impregnated packing, and malleable iron handwheel.

2.4 BALL VALVES

A. Ball Valves, 1 Inch and Smaller: Rated for 150 psi saturated steam pressure, 600 psi WOG pressure; two-piece construction; with bronze body conforming to ASTM B62, standard (or regular) port, chrome-plated brass ball, replaceable “Teflon” or “TFE” seats and seals, blowout-proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service.

B. Ball Valves, 1-1/4 Inches to 2-1/2 Inches: Rated for 150 psi saturated steam pressure, 400 psi WOG pressure, three-piece construction, with bronze body conforming to ASTM B62, full port, stainless steel ball, replaceable “Teflon” or “TFE” seats and seals, blowout proof stem, and vinyl-covered steel handle. Provide solder ends for domestic hot and cold water service.

2.5 CHECK VALVES

A. Swing Check Valves, 2 Inches and Smaller: MSS SP-80, Class 125, cast-bronze body and cap conforming to ASTM B62, with horizontal swing, Y-pattern, and bronze disc; and having threaded or solder ends. Provide valves capable of being reground while the valve remains in the line.
PART 3 – EXECUTION

3.1 VALVE ENDS SELECTION

A. Select valves with the following ends or types of pipe/tube connections:
   1. Copper Tube Size, 2 Inches and Smaller: Solder ends.
   2. Steel Pipe Sizes, 2 Inches and Smaller: Threaded end.

3.2 VALVE INSTALLATIONS

A. General Application: Use gate, ball, and butterfly valves for shut-off duty; globe, ball, and butterfly for throttling duty. Refer to piping system specification sections for specific valve applications and arrangements.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves and unions for each fixture and item of equipment arranged to allow equipment removal without system shutdown. Unions are not required on flanged devices.

D. Install balance valves in the hot water recirculation piping where shown on the drawings.

E. Install three-valve bypass around each pressure reducing valve.

F. Install valves in horizontal piping with stem at or above the center of the pipe.

G. Install valves in a position to allow full stem movement.

H. Installation of Swing Check Valves: Install for proper direction of flow and with horizontal position with hinge pin level.

I. Install access doors in ceilings or walls as required in the types and sizes to accommodate easy valve access and construction (sheet rock, etc., and fire rating).

3.3 SOLDER CONNECTIONS

A. Apply heat evenly to outside of valve around joint until solder will melt upon contact. Feed solder until it completely fills the joint around tube. Avoid hot spots or overheating valve. Once the solder starts cooling, remove excess amounts around the joint with a cloth or brush.

3.4 FIELD QUALITY CONTROL

A. Tests: After piping systems have been tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust or replace packing to stop leaks; replace valves if leak persists.

3.5 ADJUSTING AND CLEANING

A. Cleaning: Clean mill scale, grease, and protective coatings from exterior of valves and prepare valves to receive finish painting or insulation.

3.6 VALVE PRESSURE/TEMPERATURE CLASSIFICATION SCHEDULES

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>GATE</th>
<th>BALL</th>
<th>GAGES</th>
</tr>
</thead>
</table>

UMF - ECEC 22 05 23 – 3 Valves
### SERVICE

<table>
<thead>
<tr>
<th></th>
<th>GATE</th>
<th>BALL</th>
<th>GAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Hot and Cold Water</td>
<td>125</td>
<td>150</td>
<td>125</td>
</tr>
</tbody>
</table>

#### 3.7 VALVE SCHEDULE

**A. Gate Valves – 3 Inches and Smaller - Class 125:**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>THREADED NRS</th>
<th>THREADED RS</th>
<th>SOLDERED NRS</th>
<th>SOLDERED RS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milwaukee</td>
<td>UP105</td>
<td>UP148</td>
<td>UP115</td>
<td>UP149</td>
</tr>
<tr>
<td>Nibco</td>
<td>T-113-LF</td>
<td>T-111-LF</td>
<td>S-113-LF</td>
<td>S-111-LF</td>
</tr>
<tr>
<td>Stockham</td>
<td>LFB-103</td>
<td>N/A</td>
<td>LFB-104</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**B. Ball Valves – 1 Inch and Smaller:**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>OS &amp; Y RS</th>
<th>NRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conbraco (Apollo)</td>
<td>70LF-100</td>
<td>70LF-200</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>UPBA-100</td>
<td>UPBA-150</td>
</tr>
</tbody>
</table>

**C. Ball Valves – 1-1/4 Inches to 2-1/2 Inches:**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>THREADED ENDS</th>
<th>SOLDERED ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conbraco (Apollo)</td>
<td>82LF-100</td>
<td>82LF-200</td>
</tr>
<tr>
<td>Milwaukee</td>
<td>UPBA-300s</td>
<td>UPBA-350s</td>
</tr>
</tbody>
</table>

**D. Swing Check Valves – 2 Inches and Smaller:**

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>CLASS 125 THREADED ENDS</th>
<th>CLASS 125 SOLDERED ENDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milwaukee</td>
<td>UP509</td>
<td>UP1509</td>
</tr>
<tr>
<td>Nibco</td>
<td>T-413-Y-LF</td>
<td>S-413-Y-LF</td>
</tr>
<tr>
<td>Stockham</td>
<td>LFB-319Y</td>
<td>LFB-309Y</td>
</tr>
</tbody>
</table>

**END OF SECTION**
1.1 SUMMARY

A. This section includes the following:
   1. Horizontal-piping hangers and supports.
   2. Vertical-piping clamps.
   3. Hanger-rod attachments.
   4. Building attachments.
   5. Saddles and shields.
   6. Spring hangers and supports.
   7. Miscellaneous materials.
   8. Pipe alignment guides.
  10. Equipment supports.

1.2 SUBMITTALS

A. Product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer’s figure number, size, location, and features for each required pipe hanger and support.

B. Assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

C. Details of trapeze hangers and upper attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the “Quality Assurance” Article.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Hangers and supports shall comply with NFPA standard No. 13 when used as a component of a fire protection system.

B. MSS Compliance: Provide hangers, supports and components conforming to the latest requirements of MSS Standard Practices SP-58 and SP-69.

C. Qualify welding processes and welding operators according to AWS D1.1 “Structural Welding Code-Steel.”
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Qualify welding processes and welding operators according to ASME “Boiler and Pressure Vessel Code,” Section IX, “Welding and Brazing Qualifications.”
E. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100:
   1. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58:
   1. Components shall have zinc chromate or red oxide coatings where installed for piping and equipment.

B. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58:
   1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
   2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

C. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.

2.2 PIPE HANGERS AND SUPPORTS

A. Pipe Insulation Shields: Fabricated of steel with a minimum of 180 degrees unless otherwise indicated. Shields for use with hangers and supports, with the exception of combination clevis type hangers, shall be in accordance with the following schedule:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (INCHES)</th>
<th>SHIELD LENGTH (INCHES)</th>
<th>SHIELD GAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 2</td>
<td>12</td>
<td>18</td>
</tr>
</tbody>
</table>

B. Pipe Covering Protection Saddles: 3/16-inch thick steel, of sufficient depth for the insulation thickness specified, notched so that saddle contact with the pipe is approximately 50 percent of the total axial cross section. Saddles for pipe 12 inches in size and larger shall have a center support.

C. Pipe Hangers: Height adjustable standard duty, clevis-type with cross bolt and nut. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers, when supporting piping 10 inches IPS and larger.

D. Adjustable Floor Rests and Base Flanges: Steel.

E. Hanger Rods: Galvanized, mild low carbon steel, fully threaded with two (2) nuts at each end for positioning rod and hanger and locking each in place.

F. Riser Clamps: Malleable iron or steel.

G. Rollers: Cast Iron.
H. Restraints, Anchors, and Supports for Grooved End Piping System: As recommended by the grooved end fitting manufacturer.

2.3 FASTENERS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly’s Div./USM Corp. Parasleeve Series, Ramset’s Dynabolt Series, or Red Head/Phillips AN1405, HN-1614, FS-1411 Series.

B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti’s Kwik Bolt Series, Molly’s Div./USM Corp. Parabolt PB Series, Ramset’s Trubolt T Series, or Red Head/Phillips WS-3822.

C. Self-Drilling Anchors (Group III, Type 1): Ramset’s RD Series, or Red Head/Phillips Series S-14.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset’s Dynaset DS Series, Hilti’s HDI Series, or Red Head/Phillips J Series.

E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS-38 Series.

F. Continuous Slotted Type Concrete Insert, Galvanized:
   1. Load rating 800 pounds per foot: Kindorf’s D-986.
   2. Load rating 1500 pounds per foot: Kindorf’s D-980.
   3. Load rating 3000 pounds per foot: Hohmann & Barnard’s Inc. Type CS-H.
   4. Load rating 4500 pounds per foot: Hohmann & Barnard’s Inc. Type CS-HD.

G. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive 3/4-inch diameter machine bolts.

H. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, internally threaded to receive 3/4-inch bolts having special wedge-shaped heads.

I. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.4 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A36/A36M, steel plates, shapes, and bars, black, and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A183, steel, hex-head, track bolts and nuts.

C. Washers: ASTM F844, steel, plain, flat washers.

D. Grout: ASTM C1107, Grade B, non-shrink, nonmetallic.
   1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
E. Pipe Alignment Guides: Factory fabricated of cast semi-steel or heavy fabricated steel consisting of bolted two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe.  
   1. Length of guides: As recommended by manufacturer to allow indicated travel.

PART 3 – EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps and attachments to support piping properly from building structure; comply with MSS SP-69 and SP-89. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.

B. Do not hang or support one pipe from another or from ductwork.

C. Support all insulated horizontal piping conveying refrigerants or other fluids below ambient temperature, by means of hangers or supports with insulation shields installed outside of the insulation.

D. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the Drawings.

E. For Steel Pipe Gas Lines: Space hangers or supports on maximum centers of 6 feet for 1/2-inch pipe size; 8 feet for 3/4-inch and 1-inch pipe sizes and 10 feet for 1-1/4-inch pipe size above.

F. For Cast Iron Soil Pipe: Space hangers or support pipe at each joint or on maximum centers of 5 feet. Support pipe in continuous 10-foot lengths or longer on maximum centers of 10 feet. Place hangers or supports as close as possible to joints and when hangers or supports do not come within 1 foot of a branch line fitting, install an additional hanger or support at the fittings.

G. For Hubless Cast Iron Pipe: Space hangers or supports at every other joint, except when the horizontal distance between hangers exceeds 4 feet, provide hangers, or supports at each joint. Place hanger or supports as close as possible to joints and when hangers or supports do not come within 1 foot of a branch line fitting install an additional hanger or support at the fitting. Where piping is suspended on centers in excess of 18 inches by means of non-rigid hangers, provide sway bracing to prevent horizontal pipe movement. Submit details of sway braces.

H. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.

I. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

J. For Branch Piping Runs and Runouts over 5 Feet in Length: Install a minimum of one hanger and additional hangers if required by the hanger spacing schedules.

K. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smaller size of pipe being supported. Design the entire hanger assembly based on a safety factor of five (5), for the ultimate strength of the material being used.
L. Support floor drain traps from the overhead construction, with hangers of type and design as required and approved. Overhead supports are not required for floor drain traps installed directly below earth supported concrete floors.

M. Size hanger rods in accordance with the following:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (INCHES)</th>
<th>SINGLE ROD HANGER SIZE (INCHES)</th>
<th>DOUBLE ROD HANGER SIZE (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PIPE</td>
<td>TUBING</td>
</tr>
<tr>
<td>Up to 2 inches</td>
<td>3/8</td>
<td>1/4</td>
</tr>
<tr>
<td>2-1/2 and 3</td>
<td>1/2</td>
<td>3/8</td>
</tr>
<tr>
<td>4 and 5</td>
<td>5/8</td>
<td>1/2</td>
</tr>
</tbody>
</table>

N. Secure hanger rods as follows: Install one nut under clevis, angle or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each road, two at upper hanger attachment and two at hanger.

O. Vertical Piping:
1. Support vertical risers of piping systems, by means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors, with the distance between clamps not to exceed 25 feet, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, caused by operating temperature ranges.
2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.
3. Install intermediate supports between riser clamps on a maximum 6-foot centers, for copper tubing risers 1-1/4 inches in size and smaller, installed in finished rooms or spaces other than mechanical equipment rooms.
4. Floor Supports: Install adjustable yoke rests with base flanges, for the support of piping, unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

P. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

Q. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

R. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

S. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 “Building Services Piping” is not exceeded.
3.2 UPPER HANGER ATTACHMENTS

A. General:
   1. In all cases, secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
   2. Do not attach hangers to steel decks which are not to receive concrete fill.
   3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
   4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.
   1. Do not use drive-on beam clamps.
   2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
   3. Do not drill holes in main structural steel members.
   4. “C” clamp type of upper hanger attachments with restraining straps may be used as upper hanger attachments for the support of piping up to a maximum of 3 inches in size and a temperature from 50 DegF to 200 DegF.

3.3 TRAPEZES

A. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

3.4 ANCHORS, RESTRAINTS, RIGID SUPPORTS, STAYS, AND SWAY BRACES

A. Install pipe anchors, restraints, and sway braces, at locations noted on the Drawings. Design anchors so as to permit piping to expand and contract freely in opposite directions, away from anchor points. Install anchors independent of all hangers and supports, and in a manner which will not affect the structural integrity of the building.

3.5 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD, AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield and vapor barrier jacketed high density insulating saddles, at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces, of the same material, thickness and length, for installation over the top 180-degree surface of pipe or tubing, at each point of support where an insulated clevis hanger is utilized.

3.6 PIPE INSULATION SHIELDS

A. Install a pipe insulation shield, at all points of support, for piping insulated with cold service insulation. Center shields on all hangers and supports and install in such a manner so as not to cut, puncture or press into the insulation, or in any manner be detrimental to the vapor barrier.

3.7 PIPE COVERING PROTECTION SADDLES

A. Install pipe covering protection saddles at all points of support, for steel piping 6 inches in size and larger, insulated with hot service insulation. Weld saddles to piping to insure movement with pipe.
3.8 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and with AWS Standards D1.1.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer’s written instructions to control movement to compensators.

D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.9 INSTALLATION OF PIPE ALIGNMENT GUIDES

A. Install pipe alignment guides on piping that adjoins expansion joints and elsewhere as indicated.

B. Anchor to building substrate.

3.10 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for piping and equipment.

3.11 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors in indicated locations.

B. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.
   1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. Ferrous Metals: Clean galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structure Painting Council.
   1. Blast steel surfaces clean as recommended by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 10.
   2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
   3. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.

D. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
E. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

F. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.12 ADJUSTING

A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION
SECTION 22 07 00
PLUMBING INSULATION

PART 1 – GENERAL

1.1 SUMMARY
A. This Section includes pipe and equipment insulation.

1.2 DEFINITIONS
A. Hot Surfaces: Normal operating temperatures of 100 DegF or higher.
B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
C. Cold Surfaces: Normal operating temperatures less than 75 DegF.
D. Thermal Resistivity: “r-values” represent the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees Fahrenheit between two exposed faces required to cause one Btu to flow through one square foot of material, in one hour, at a given mean temperature.
E. Density: Is expressed in lb/sq.ft.

1.3 SUBMITTALS
A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
B. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.
C. Manufacturer’s installation instructions.
D. Schedule of materials and thickness for each piece of equipment.

1.4 QUALITY ASSURANCE
A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
   1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

1.5 SEQUENCING AND SCHEDULING
A. Schedule insulation application after testing of piping systems.
PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Glass Fiber:
      a. CertainTeed Corporation.
      b. Knauf Fiberglass GmbH.
      c. Manville.
      d. Owens-Corning Fiberglas Corporation.
      e. USG Interiors, Inc. - Thermafiber Division.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.


C. Preformed Pipe Insulation: ASTM C547, Class 1, rigid pipe insulation, jacketed.

   1. Thermal Conductivity: 0.27 average maximum at 75 DegF mean temperature.
   2. Density: 10 average maximum.

D. Adhesive: Produced under the UL Classification and Follow-up service.

   1. Type: Non-flammable, solvent-based.
   2. Service Temperature Range: Minus 20 to 180 DegF.

E. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 ADHESIVES

A. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:

   1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
   2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.4 JACKETS

A. General: ASTM C921, Type 1, except as otherwise indicated.


   1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E96.
   2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D781.

C. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20-mil-thick, roll stock ready for shop or field cutting and forming to indicated sizes.
1. Adhesive: As recommended by insulation manufacturer.

D. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.
   1. Adhesive: As recommended by insulation manufacturer.

2.5 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, presized a minimum of 8 ounces per square yard.
   1. Tape Width: 4 inches.
   2. Cloth Standard: MIL-C-20079H, Type I.
   3. Tape Standard: MIL-C-20079H, Type II.

B. Bands: 3/4-inch wide in one of the following materials compatible with jacket:
   1. Stainless Steel: Type 304, 0.020-inch thick.
   2. Galvanized Steel: 0.005-inch thick.
   3. Aluminum: 0.007-inch thick.
   4. Brass: 0.01-inch thick.
   5. Nickel-Copper Alloy: 0.005-inch thick.

C. Wire: 14-gage nickel copper alloy, 16-gage, soft-annealed stainless steel, or 16-gage, soft-annealed galvanized steel.

D. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch Kraft paper.

E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.6 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.
   1. Water Vapor Permeance: 0.08 perm maximum.
   2. Temperature Range: Minus 20 to 180 DegF.

PART 3 – EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes and equipment having surface operating temperatures below 60 DegF.
D. Install insulation only after systems to be insulated have been tested and approved.
E. Apply insulation material, accessories, and finishes according to the manufacturer’s printed instructions.
F. Install insulation with smooth, straight, and even surfaces.
G. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.
H. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.
I. Seal Ends: Taper ends at 45-degree angle and seal with lagging adhesive.
J. Apply adhesives and coatings at manufacturer’s recommended coverage-per-gallon rate.
K. Keep insulation materials dry during application and finishing.
L. Items Not Insulated: Unless otherwise indicated do not apply insulation to the following systems, materials, and equipment:
   1. Flexible connectors for pipes.
   2. Vibration control devices.
   3. Testing laboratory labels and stamps.
   5. Access panels and doors in air distribution systems.
   6. Sanitary drainage and vent piping except for exposed sanitary on fixtures for the disabled.
   7. Drainage piping located in crawl spaces, unless indicated otherwise.
   8. Below grade piping.
   9. Chrome-plated pipes and fittings except for plumbing fixtures for the disabled.
   10. Piping specialties including air chambers, unions, strainers, check valves, plug valves, and flow regulators.

3.3 PIPE INSULATION INSTALLATION, GENERAL
A. Tightly butt longitudinal seams and end joints. Bond with adhesive.
B. Stagger joints on double layers of insulation.
C. Apply insulation continuously over fittings, valves, and specialties except as otherwise indicated.
D. Apply insulation with a minimum number of joints.
E. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Cover circumferential joints with butt strips, at least 3 inches wide and of same material as insulation jacket. Secure with adhesive along both edges of butt strip and space 4 inches on center.
   3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
   4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints and at ends butt to flanges, unions, valves, and fittings.
5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.

6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.

G. Exterior Wall Penetrations: For penetrations of below grade exterior walls, extend metal jacket for exterior insulation through penetration to a point 2 inches from interior surface of wall inside the building. Seal ends of metal jacket with vapor barrier coating. Secure metal jacket ends with metal band. At point where insulation metal jacket contacts mechanical sleeve seal, insert cellular glass preformed pipe insulation to allow sleeve seal tightening against metal jacket. Tighten and seal sleeve to jacket to form a watertight seal.

H. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer. Refer to Division 7.

I. Fire/Smoke-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer. Refer to Division 7 for firestopping and fire-resistant joint sealers.

J. Floor Penetrations: Terminate insulation underside of floor assembly and at floor support at top of floor.

K. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
1. Use same material and thickness as adjacent pipe insulation.
2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
4. Insulate elbows and tees smaller than 3-inch pipe size with premolded insulation.
5. Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least three (3) segments for each elbow.
6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
7. Cover insulation, except for metal jacketed insulation, with two (2) layers of lagging adhesive to a minimum thickness of 1/16 inch. Install glass cloth between layers. Overlap adjacent insulation by 2 inches in both directions from joint with glass cloth and lagging adhesive.

L. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Section “Hangers, Supports and Anchors.” For cold surface piping, extend insulation anchor legs a minimum of 12 inches and taper and seal insulation ends.
1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

2. Special Treatment at Hanger Locations: At hanger locations on insulated piping 2 inches and larger, install high density rigid fiber glass pipe support blocks. On piping up to and including 5 inches, install one (1) block at each hanger, directly on the bottom of the pipe. For 6-, 8-, and 10-inch piping, install two (2) blocks at each hanger oriented 30 degrees from each side of the bottom. For piping 12 inches and larger, orientate blocks at both the 30 degrees positions and directly on the bottom. Install blocks inside cut out section of pipe insulation, being careful not to damage the vapor barrier jacketing. Any jacketing so damaged should be repaired with matching vapor barrier tape.

3.4 GLASS FIBER PIPE INSULATION INSTALLATION

A. Bond insulation to pipe with lagging adhesive.

B. Seal exposed ends with lagging adhesive.

C. Seal seams and joints with vapor barrier compound.

3.5 EQUIPMENT INSULATION INSTALLATION, GENERAL

A. Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.

B. Insulation Thicknesses Greater than 2 Inches: Install insulation in multiple layers with staggered joints.

C. Bevel insulation edges for cylindrical surfaces for tight joint.

D. Secure sections of insulation in place with wire or bands spaced at 9-inch centers except for flexible elastomeric cellular insulation.

E. Protect exposed corners with corner angles under wires and bands.

F. Manholes, Handholes, and Information Plates: Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

G. Removable Insulation: Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.

H. Pumps: Where insulation is indicated, fabricate galvanized steel boxes lined with insulation. Fit boxes around pumps and coincide joints in box with the splits in the pump casings. Fabricate joints with outward bolted flanges.

I. Finishing: Except for flexible elastomeric cellular insulation, apply two (2) coats of vapor barrier compound to a minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers.

3.6 GLASS FIBER EQUIPMENT INSULATION INSTALLATION

A. Secure insulation with anchor pins and speed washers.
B. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.

C. Apply a smoothing coat of insulating and finishing cement to finished insulation.

3.7 JACKETS

A. Interior Exposed Insulation: Install continuous PVC jackets.

B. Install the PVC jacket with 1-inch overlap at longitudinal and butt joints and seal with adhesive.

3.8 FINISHES

A. Paint finished insulation as specified in Division 9.

3.9 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Interior Piping Systems: Unless otherwise indicated, insulate the following piping systems:
   1. Domestic cold water.
   2. Domestic hot water.
   3. Domestic recirculated hot water.
   4. Sanitary drains for fixtures accessible to the disabled.

C. Equipment: Unless otherwise indicated, insulate the following indoor equipment:
   1. Domestic cold water equipment, tanks, and pumps.
   2. Domestic hot water equipment, tanks, and water heaters.
   3. Refrigerated drinking water equipment, tanks, pumps, and heat exchangers.

3.10 PIPE INSULATION SCHEDULES

A. General: Abbreviations used in the following schedules include:
   1. Field-Applied Jackets:
      a. P – PVC.

B. Domestic Cold Water, Cooling Coil Condensate, and Storm Water All Sizes (Interior):
   1/2-inch-thick glass fiber insulation. Field-applied jacket is not required.

C. Interior Domestic Hot Water and Recirculated Hot Water:

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<th>PIPE SIZES (NPS)</th>
<th>MATERIALS</th>
<th>THICKNESS IN INCHES</th>
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D. Sanitary Drains and Traps Exposed at Fixtures for Disabled:

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3.11 EQUIPMENT INSULATION SCHEDULES

A. General: Abbreviations used in the following schedules include:
   1. Field-Applied Jackets:
      a. P - PVC.
      c. A - Aluminum.
      d. SS - Stainless Steel.
   3. Interior Exposed Domestic Cold Water Equipment, Tanks, and Pumps:

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<th>FORM</th>
<th>THICKNESS IN INCHES</th>
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4. Interior Exposed Domestic Hot Water Equipment, Tanks, and Pumps:

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5. Interior Exposed Refrigerated Drinking Water Equipment, Tanks, Pumps, and Heat Exchangers:

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END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
A. This Section includes potable water distribution, including cold- and hot-water supply and hot-water recirculation to a point 5 feet outside the building.

1.2 SUBMITTALS
A. Product data for all products specified in this section.
B. Water samples, test results, and reports specified in “Field Quality Control” and “Cleaning” Articles.
C. Coordination drawings, drawn accurately to scale and coordinating penetrations.

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. Provide piping system with the following minimum working pressure ratings, except where indicated otherwise:

1.4 QUALITY ASSURANCE
A. Comply with the provisions of ASME B31.9 “Building Services Piping” for materials, products, and installation.
B. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

PART 2 – PRODUCTS

2.1 GENERAL
A. All products specified in this section shall be manufactured in the USA and/or Canada.
B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Couplings for Grooved-End Copper Tube and Grooved-End Copper Fittings:
      a. Victaulic Co. of America.

2.2 PIPES AND TUBES
A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article “Pipe and Fittings Applications.”
B. Hard Copper Tube: ASTM B88, Type L, water tube, drawn temper.
2.3 PIPE FITTINGS AND TUBE FITTINGS

A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.

B. Wrought-Copper and Bronze, Grooved-End Fittings: ASTM B75 Tube and ASTM B584 Bronze Castings.

C. Bronze Flanges: ASME B16.24, Classes 150 and 300.

D. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends.

2.4 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in other Sections.

B. Couplings for Grooved-End Copper Tube and Grooved-End Copper Fittings: ASTM A536 ductile-iron or ASTM A47 malleable-iron housing having copper-colored enamel finish, with synthetic-rubber gasket having central-cavity, pressure-responsive design and suitable for hot water, with ASTM A183 carbon-steel bolts and nuts.

2.5 VALVES

A. Refer to other Sections.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Excavation, trenching, and backfilling are specified elsewhere.

3.2 PIPE AND FITTINGS APPLICATIONS

A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.

B. Water Distribution Piping Below Ground: Use the following:
   1. 3 Inches and Smaller: Soft copper tube, Type K, cast-copper-alloy solder-joint pressure fittings and soldered joints with Alloy Sn95 solder.

C. Water Distribution Piping Above Ground: Use the following:
   1. 4 to 6 Inches: Hard copper tube, Type L; wrought-copper and bronze grooved-end fittings; couplings for grooved-end copper tube and grooved-end copper fittings; and grooved copper tube and grooved tube fitting joints.
   2. 6 Inches and Smaller: Hard copper tube, Type L; wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges; and solder joints with Alloy Sn95 solder.

3.3 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
1. Shutoff Duty: Use gate, ball, or butterfly valves.
2. Throttling Duty: Use globe, ball, or butterfly valves.

3.4 PIPING INSTALLATION, GENERAL

A. Basic piping installation requirements are specified in other Sections.

3.5 SERVICE ENTRANCE PIPING

A. Extend water distribution piping and connect to water service piping of size and in location indicated for service entrance to building. Coordinate with other Sections.

B. Install shutoff valve, inside building at water service entrance.

C. Ductile-Iron Water Service Pipe: Comply with AWWA C600. Install buried pipe inside building between shutoff valve, wall and floor penetrations, and point 5 feet outside building, with restrained joints, including anchoring pipe to wall or floor. Provide supports (thrust blocks) at vertical and horizontal offsets.
   1. Wrap pipe with polyethylene encasement.

D. Install sleeve at service penetrations through foundation wall.

E. Install sleeve and mechanical sleeve seal at service penetrations through below grade walls.

3.6 WATER DISTRIBUTION PIPING INSTALLATION

A. Install piping with 1/32-inch-per-foot (1/4 percent) slope downward toward drain.

3.7 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in other Sections.

B. Grooved Copper Tube and Grooved-Tube Fitting Joints: Assemble joints with coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer’s written instructions.

3.8 ROUGHING-IN FOR WATER METER

A. Install roughing-in piping and plumbing specialties specified in other Sections for water meter installation according to utility company’s instructions and requirements.

3.9 INSTALLATION OF VALVES

A. Sectional Valves: Install sectional valves close to main on each branch and riser serving two (2) or more plumbing fixtures or equipment connections and where indicated.

B. Shutoff Valves: Install shutoff valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.

C. Drain Valves: Install drain valves, specified in other Sections, on each plumbing equipment item located to drain equipment for service and repair. Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.
   1. Install hose-end drain valves at low points in water mains, risers, and branches.
D. Check Valves: Install check valve on discharge side of each pump and elsewhere as indicated.

E. Balance Valves: Install valve in each hot-water circulating loop, discharge side of each pump, and elsewhere as indicated.

3.10 HANGERS AND SUPPORTS INSTALLATION

A. Hanger, support and anchor devices are specified in other Sections.

3.11 CONNECTIONS

A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts of sizes indicated, but not smaller than required by plumbing code to fixtures.

3.12 FIELD QUALITY CONTROL

A. Inspect water distribution piping as follows:
   1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
   2. During progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the plumbing official.
      a. Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.
      b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
   3. Reinspections: When a plumbing official finds that piping system will not pass test or inspection, make required corrections and arrange for reinspection by the plumbing official.
   4. Reports: Prepare inspection reports signed by plumbing official.

B. Test water distribution piping as follows:
   1. Test for leaks and defects in new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of system tested.
   2. Leave uncovered and unconcealed in new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved for testing.
   3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
   4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
   5. Prepare reports for tests and required corrective action.

3.13 CLEANING

A. Clean and disinfect water distribution piping as follows:
   1. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.
2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if a method is not prescribed by that authority, the procedure described in either AWWA C651 or AWWA C652 or as described below:
   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill system or part thereof with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) and allow to stand for 24 hours.
   c. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine. Isolate and allow to stand for 3 hours.
   d. Flush system with clean, potable water until the chlorine level matches the level in clean potable water source.
   e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by the authority shows evidence of contamination.

B. Prepare and submit reports for purging and disinfecting activities.

C. Clean interior of piping system. Remove dirt and debris as work progresses.

3.14 COMMISSIONING

A. Fill water systems. Check compression tanks to determine that they are not air bound and that system is completely full of water.

B. Before operating systems, perform these steps:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to full open position.
   3. Open throttling valves to proper setting.
   4. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
   5. Remove, clean, and reinstall strainer screens. Replace damaged strainer screens. Close drain valves and replace drain plugs.
   6. Remove filter cartridges from housings and verify that cartridges are clean, and ready for use.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

D. Check plumbing specialties and verify proper settings, adjustments, and operation.

E. Energize pumps and verify proper operation.

END OF SECTION
SECTION 22 11 19
PLUMBING SPECIALTIES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes plumbing specialties for water distribution systems; and soil, waste, and vent systems.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working pressure ratings, except where otherwise indicated:

1.3 SUBMITTALS

A. Submit product data for all materials specified within this Section, including rated capacities of selected models and weights (shipping, installation, and operation). Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following plumbing specialty products.

B. Maintenance data for all materials specified within this Section for inclusion in Operating and Maintenance manuals.

1.4 QUALITY ASSURANCE

A. Comply with ASME B31.9, “Building Services Piping,” for materials, products, and installation.


C. Listing and Labeling: Provide equipment that is listed and labeled.
   1. The Terms “Listed” and “Labeled” as defined in the “National Electrical Code,” Article 100.

D. Design Concept: The Drawings indicate capacities, sizes, and dimensional requirements of system components. Components having equal performance characteristics that deviate from the indicated size and dimensions may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality of products is on the Contractor.

1.5 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and identify with labels clearly describing contents.
B. Water Filter Cartridges: Furnish quantity not less than 200 percent of amount of each type and size installed.

C. Operating Keys (Handles): Furnish two (2) extra keys for each key-operated hose bibb and hydrant installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Water Meters:
   a. Badger Meter, Inc.
   b. Hersey Products, Inc., Grinnell Corp.

2. Backflow Preventers:
   a. Conbraco Industries, Inc.
   b. Febco.
   c. Watts Regulator Co.
   d. Wilkins Regulator Div., Zurn Industries, Inc.

3. Water Pressure Regulators:
   a. Conbraco Industries, Inc.
   b. Spence Engineering Co., Inc.
   c. Watts Regulator Co.
   d. Wilkins Regulator Div., Zurn Industries, Inc.

4. Thermostatic Water-Mixing Valves:
   b. Lawler Manufacturing Co., Inc.
   c. Leonard Valve Co.
   d. Powers Process Controls Unit, Mark Controls Corp.
   e. Symmons Industries, Inc.
   f. T & S Brass and Bronze Works, Inc.

5. Water-Tempering Valves:
   b. Leonard Valve Co.
   c. Watts Regulator Co.

6. Wall Hydrants and Post Hydrants:
   a. Josam Co.
   c. Watts Regulator Co.
   d. Zurn by Hydromechanics Div., Zurn Industries, Inc.

7. Water Hammer Arresters:
   a. Amtrol, Inc.
   b. Josam Co.
   d. Watts Regulator Co.
   e. Zurn by Hydromechanics Div., Zurn Industries, Inc.
8. Trap Seal Primer Valves:
   a. Jones Manufacturing Co., Inc.
   b. Josam Co.
   d. Wade Div., Tyler Pipe.
   e. Watts Regulator Co.
   f. Zurn by Hydromechanics Div., Zurn Industries, Inc.

9. Sleeve Penetration Systems:
   a. Proset Systems, Inc.

2.2 WATER METERS

A. General: Register in gallons, except where registration in cubic feet is indicated.

B. Water Meters: AWWA C700, displacement (disc) type, with bronze main case.

C. Remote Registration Systems: Specified water meter type, modified to include factory- or field-installed, self-contained, pulsing-type, generating system transmitter. Include low-voltage connecting wiring, totalizing device, and remote wall register.
   1. Direct-Reading, Remote-Registration System: AWWA C706; meter-mounted transmitter; 2-conductor connecting wire; weatherproof, outdoor, remote totalizing wall unit for visual reading; and conforming to utility standards.

2.3 BACKFLOW PREVENTERS

A. General: ASSE Standard, backflow preventers, of size indicated for maximum flow rate indicated and maximum pressure loss indicated.
   1. Working Pressure: 150 psig minimum except where indicated otherwise.
   2. 2 Inches and Smaller: Bronze body with threaded ends.
   3. 2-1/2 Inches and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
   5. Exterior Finish: Manufacturer’s standard finish unless noted otherwise.
   6. Strainer on inlet, where strainer is indicated.

B. Pipe-Applied, Atmospheric-type Vacuum Breakers: ASSE 1001, with floating disc and atmospheric vent.

C. Hose Connection Vacuum Breakers: ASSE 1011, nickel plated, with non-removable and manual drain features, and ASME B1.20.7 garden-hose threads on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.

D. Intermediate Atmospheric-Vent Backflow Preventers: ASSE 1012, consisting of inlet screen and two (2) independent check valves with intermediate atmospheric vent for continuous pressure application.

E. Reduced-Pressure-Principle Backflow Preventer: ASSE 1013, consisting of (OS&Y) gate valves on inlet and outlet and strainer on inlet. Include test cocks and pressure-differential relief valve having ASME A112.1.2 air-gap fitting located between two (2) positive-seating check valves for continuous pressure application.
   1. Pressure Loss: 12 psig maximum, through middle one third of flow range.
F. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, consisting of valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous pressure application.
   1. Pressure Loss: 5 psig maximum, through middle one third of flow range.

2.4 WATER PRESSURE REGULATORS

A. General: ASSE 1003, water pressure regulators, rated for initial working pressure of 150 psig minimum, of size, flow rate, and inlet and outlet pressures indicated. Include integral factory-installed or separate field-installed Y-type strainer.
   1. 2 Inches and Smaller: Bronze body with threaded ends.
   2. 2-1/2 Inches and Larger: Bronze or cast-iron body with flanged ends.
   4. Exterior Finish: Polished chrome plate when used in chrome plated piping system.

B. Single-seated, direct-operated type.

C. Single-seated, direct-operated, integral-bypass type.

D. Pilot-operated type, single- or double-seated, cast-iron body main valve, with bronze-body pilot valve.

2.5 THERMOSTATIC WATER-MIXING VALVES

A. General: ASSE 1017, manually adjustable, thermostatic water-mixing valve with bronze body. Include checkstop and union on hot-water and cold-water supply inlets, adjustable temperature setting, and capacity at pressure loss as indicated.
   1. Operation and Pressure Rating: Bimetal thermostat, 125 psig minimum.

B. Thermostatic Water-Mixing Valves: Unit, with options as indicated.
   1. Piping, of sizes and in arrangement, with valves and unions indicated.
   5. Cabinet Mounting: Surface.
   6. Thermometer.

C. Manifolded, Thermostatic Water-Mixing Valve Assemblies: Factory-fabricated unit consisting of parallel arrangement of thermostatic water-mixing valves.
   1. Arrangement: 1 large-flow thermostatic water mixing valve with flow control valve, pressure regulator, inlet and outlet pressure gages, and 1 small-flow thermostatic water-mixing valve with flow control valve. Include outlet thermometer, factory- or field-installed inlet and outlet valves, and other indicated options.
   2. Piping, of sizes and in arrangement, with valves and unions, indicated.
   5. Cabinet: Stainless-steel box with stainless-steel, hinged door.
2.6 WATER-TEMPERING VALVES

A. General: Manually-adjustable, thermostatically-controlled water-tempering valve, bronze body, and adjustable temperature setting.

B. System Water-Tempering Valves: Piston or discs controlling both hot-water and cold-water flow, capable of limited anti-scald protection. Include threaded inlets and outlet, and capacity at pressure loss, and temperature range or setting as indicated.
   1. Finish: Rough bronze, except where chrome-plated finish is indicated.

C. Limited-Volume Water-Tempering Valves: Solder-joint inlets and outlet, capacity indicated at pressure loss indicated.

2.7 MISCELLANEOUS PIPING SPECIALTIES

A. Piping specialties such as escutcheons, dielectric fittings, sleeves, and sleeve seals are specified in other Sections.

B. Strainers: Y pattern, except where otherwise indicated, full size of connecting piping. Include Type 304 stainless-steel screens with 3/64-inch perforations except where other screens are indicated.
   1. Pressure Rating: 125-psig minimum steam working pressure except where otherwise indicated.
   2. Sizes 2 Inches and Smaller: Bronze body, with female threaded ends.
   3. Y-Type Strainers: Screwed screen retainer with centered blowdown.

C. Hose Bibbs: Bronze body, with renewable composition disc, 1/2- or 3/4-inch threaded or solder-joint inlet. Provide ASME B1.20.7 garden-hose threads on outlet and integral or field-installed, nonremovable, drainable, hose-connection vacuum breaker.
   1. Finish: Rough brass, Chrome or nickel plated.
   2. Operation: Operating key (handle). Provide one (1) operating key.

D. Wall Hydrants: ASME A112.21.3M, nonfreeze, key operation. Provide one (1) operating key.
   1. Inlet: 3/4- or 1-inch threaded or solder joint.
   2. Outlet: ASME B1.20.7 garden-hose threads, and integral or field-installed, nonremovable and drainable hose-connection vacuum breaker having ASME B1.20.7 garden-hose threads on outlet.
   3. Type: Projecting.

E. Water Hammer Arresters: ASME A112.26.1M, ASSE 1010, or PDI WH-201, bellows or piston type with pressurized cushioning chamber. Sizes are based on water-supply fixture units, ASME A112.26.1M sizes “A” through “F” and PDI WH-201 sizes “A” through “F.”

F. Trap Seal Primer Valves: ASSE 1018, water-supply-fed type, with the following characteristics:
   1. 125-psig minimum working pressure.
   2. Bronze body with atmospheric-vented drain chamber.
   3. Inlet and Outlet Connections: 1/2-inch threaded, union, or solder joint.
   4. Gravity Drain Outlet Connection: 1/2-inch threaded or solder joint.
   5. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
G. Air-Admittance Valves: ASSE 1051, plastic housing with mechanical-operation sealing diaphragm, designed to admit air into drainage and vent system piping and prevent transmission of sewer gas into building.
   1. Fixture Vent Valve: Designed for installation on waste piping (instead of vent connection) for single fixture, in sizes 1-1/4 through 2 inches.
   2. Stack Vent Valve: Designed for installation as terminal on soil, waste, and vent stacks (instead of stack vent extending through roof), in sizes 2 through 4 inches.

H. Stack Flashing Fittings: Counterflashing-type, cast-iron fitting, with bottom recess for termination of roofing membrane, and with threaded or hub top for extension of vent pipe.

I. Vent Caps: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and set-screws to secure to vent pipe.

J. Vent Terminals: Commercially manufactured, shop-fabricated or field-fabricated, frost-proof assembly constructed of galvanized steel, copper, or lead-coated copper. Size to provide 1-inch enclosed air space between outside of pipe and inside of flashing collar extension, with counterflashing, as indicated.

K. Roof Flashing Assemblies: Manufactured assembly consisting of 4-psf lead flashing collar with boot and skirt extending at least 8 inches from pipe, with galvanized steel boot reinforcement and counterflashing fitting.
   1. Option 1: Open top.
   2. Option 2: Low-silhouette model with vandal-proof vent cap.
   3. Option 3: Extended model with field-installed, vandal-proof vent cap.

2.8 CLEANOUTS

A. General: Size cleanouts as indicated on drawings, or where not indicated, same size as connected drainage piping. Cleanouts larger than 4 inches are not required except where indicated.

B. Cleanouts: ASME A112.36.2M, cast-iron body with straight threads and gasket seal or taper threads for plug, flashing flange and clamping ring, and a brass closure plug. Cleanouts for installation in floors not having membrane waterproofing may be furnished without clamping ring. See Product Data Sheet at end of Part 3 of this Section for deck plate shape, top-loading classification, access cover, finish, and other specific features.

C. Products: Subject to compliance with requirements, provide one of the products specified in each schedule.

2.9 FLOOR DRAINS

A. General: Size outlets as indicated on schedule.

B. Floor Drains: ASME A112.21.1M, cast-iron body, with seepage flange and clamping device. Floor drains for installation in floors not having membrane waterproofing may have seepage flange without clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device. See schedule for shape, dimensions, strainer and body top finish, top-loading classification, sump size, and specific features.

C. Open Drains: Shop- or field-fabricate from ASTM A74, Service Class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P trap, hub-and-spigot riser section of length to provide depth indicated,
and where indicated increaser fitting of size indicated, joined with ASTM C564 neoprene gaskets. Size P trap as indicated on drawings.

D. Deep Seal Traps: Cast iron or bronze, with inlet and outlet matching connected piping, cleanout where indicated, and trap seal primer valve connection where indicated.
1. 2-Inch Size: 4-inch-minimum water seal.
2. 2-1/2 Inches and Larger: 5-inch-minimum water seal.

E. Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

F. Air Gap Fittings: ASME A112.1.2, cast iron or cast bronze, with fixed air gap, inlet for drain pipe or tube, and threaded or spigot outlet.

G. Products: Subject to compliance with requirements, provide one of the products specified in each Plumbing Specialties Product Data Sheet at end of this Section.

2.10 INTERCEPTORS

A. General: Units of type, operation, flow rate, storage or retention capacity; with integral or field-installed cleanout on outlet; and other features indicated.

B. Grease Interceptors: PDI G-101, having maximum flow capacity of 100 gallons per minute and grease retention capacity of 200 lb.

C. Arrangement: Interior baffles, removable cover, flow control fitting, and cleanout on outlet.
1. Material: Cast iron or steel with corrosion-resistant coating.

D. Solids Interceptors: Features include settlement chambers; baffles; removable basket, strainer, screens, or other means of cleaning; and removable cover.
1. Material: Cast iron, steel, stainless steel, or bronze, as indicated.

E. Products: Subject to compliance with requirements, provide one of the products specified in the schedule.

2.11 SLEEVE PENETRATION SYSTEMS

A. Description: UL 1479, through-penetration firestop assembly consisting of sleeve and stack fitting with firestopping plug.
1. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on 1 end for installation in cast-in-place concrete slabs.
a. Special Coating: Include corrosion-resistant interior coating on fittings for plastic chemical waste and vent stacks.
2.12 FLASHING MATERIALS

A. Lead: ASTM B 749, Type L51121, copper-bearing sheet, at least 4 psf (0.0625-inch thick) for general use, and at least 6 psf (0.0937-inch thick) for burning (welding), except as otherwise indicated.

B. Elastic Membrane: Non-reinforced flexible, black elastic, sheet, 50- to 65-mil thick and complying with the following:
   2. Tensile Strength: ASTM D412, 1200 psi.
   6. Resistance to Ozone Aging: ASTM D1149, no cracks for 10 percent elongated sample for 100 hours in 50-mPa ozone at 104 DegF (70 DegC).
   7. Resistance to Heat Aging: ASTM D573, maximum hardness increase of 15 points, elongation reduction of 40 percent, and tensile strength reduction of 30 percent, for 70 hours at 212 DegF (100 DegC).

PART 3 – EXECUTION

3.1 INSTALLATION OF WATER METER

A. Install water meter according to utility company’s written installation instructions and requirements.

B. Size meter and arrange piping and specialties to comply with utility company’s requirements.

C. Mount meter on wall brackets or floor post supports.

D. Mount remote-registration devices in locations indicated. Drill hole in exterior wall and install connecting wire. Seal hole with single-part, neutral-curing silicone sealant specified in other Sections.

3.2 ROUGHING-IN FOR WATER METER

A. Install roughing-in piping and specialties for water meter installation according to utility company’s instructions and requirements.

3.3 PIPING SPECIALTY INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated, at each water supply connection to mechanical equipment and systems, and to other equipment and systems as indicated. Comply with plumbing code and authority having jurisdiction. Locate in same room as equipment being connected. Install air-gap fitting on units having atmospheric vent connection and pipe relief outlet drain to nearest floor drain. Do not install bypass around backflow preventer.

B. Install pressure-regulating valves with inlet and outlet shutoff valves and balance cock bypass. Install pressure gage on valve outlet and install valved bypass where indicated.

C. Install strainers on supply side of each control valve, pressure-regulating valve, and solenoid valve, and where indicated.
D. Install hose bibbs with integral or field-installed vacuum breaker.

E. Install wall hydrants with integral or field-installed vacuum breaker.

F. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of 1/8 inch per foot (1 percent) and connect to floor drain body, trap, or inlet fitting. Adjust valve for proper flow.

G. Install expansion joints on vertical risers, stacks, and conductors as indicated.

H. Install cleanouts in above-ground piping and building drain piping as indicated, and where not indicated, according to the following:
   1. Size same as drainage piping up to 4-inch size. Use 4-inch size for larger drainage piping except where larger size cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil or waste stack.

I. Install cleanout deck plates (covers), of types indicated, with top flush with finished floor, for floor cleanouts for piping below floors.

J. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.

K. Install flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.

L. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to the manufacturer’s written instructions.

M. Install frost-proof vent caps on each vent pipe passing through roof. Maintain 1-inch clearance between vent pipe and roof substrate.

3.4 FLOOR DRAIN INSTALLATION

A. Install floor drains according to manufacturer’s written instructions, in locations indicated.

B. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.

C. Set drain elevation depressed below finished slab elevation as listed below to provide proper floor slope to drain:
   1. 5-Foot Drain Area Radius: 1/2-inch depression.
   2. 10-Foot Drain Area Radius: 3/4-inch depression.
   3. 15-Foot Drain Area Radius: 1-inch depression.
   4. 20-Foot Drain Area Radius: 1-1/4-inch depression.
   5. 25-Foot Drain Area Radius: 1-1/2-inch depression.

D. Trap drains connected to sanitary building drain.
E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

F. Position drains for easy accessibility and maintenance.

3.5 INTERCEPTOR INSTALLATION

A. General: Comply with unit manufacturer’s written installation instructions and with local authority for trapping and venting.

B. Install units with clear space for servicing.

C. Install waste piping, flow control fitting, vent piping, and accessories as indicated.
   1. Install control panel for grease recovery unit as indicated.

D. Above-Floor Installation: Set unit with bottom resting on floor, except where otherwise indicated.

E. Flush with Floor Installation: Set unit and extension when required, with cover flush with finished floor.

F. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.

G. Pit Installation: Set unit in pit, as indicated.

H. Install cleanout immediately downstream of interceptor units not having integral cleanout on outlet.

3.6 CONNECTIONS

A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts to fixtures of sizes indicated, but not smaller than required by plumbing code.

B. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated, but not smaller than required by plumbing code.

C. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

D. Interceptor Connections: Connect piping, flow control fittings, and accessories as indicated.
   1. Grease Interceptors: Connect inlet and outlet to unit, and flow control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff type unit.
   2. Solids Interceptors: Connect inlet and outlet.

E. Electrical Connections: Power wiring and disconnect switches are specified in Division 26.
   1. Grounding: Connect unit components to ground according to the National Electrical Code and Division 26.

3.7 FLASHING INSTALLATION

A. Provide flashing manufactured in a single piece except where large pans, sumps, or other drainage shapes are required.
B. Install 4-psf lead flashing or 16-ounce per square-foot copper except when another weight or material is specified.

C. Install 6-psf lead flashing or heavier where burning (welding) of lead sheets is required.

D. Solder joints of copper sheets where required.

E. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with membrane waterproofing.
   1. Pipe Flashing: Sleeve type, matching pipe size, with minimum sleeve length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
   2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
   3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

F. Set flashing on floors and roofs in solid coating of bituminous cement.

G. Secure flashing into sleeve and specialty clamping ring or device.

H. Install flashing for piping passing through roofs with counter flashing or commercially made flashing fittings, according to Division 7 Section “Flashing and Sheet Metal.”

I. Extend flashing up vent pipe passing through roofs and turn down into pipe or secure flashing into cast-iron sleeve having caulkng recess.

J. Fabricate and install lead sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

K. Fabricate and install copper sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

L. Fabricate and install galvanized-steel sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

M. Fabricate and install elastic-membrane sheet flashing and pans, sumps, and other drainage shapes as indicated. Install drain connection when indicated.

3.8 COMMISSIONING

A. Preparation: Perform the following checks before start-up:
   1. Systems tests are complete.
   2. Damaged and defective specialties and accessories have been replaced or repaired.
   3. There is clear space for servicing of specialties.

B. Before operating systems, perform these steps:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open valves to full open position.
   3. Remove and clean strainers.
   4. Verify drainage and vent piping are clear of obstructions. Flush with water until clear.

C. Starting Procedures: Follow manufacturer’s written procedures. If no procedures are prescribed by manufacturer, proceed as follows:
1. Energize circuits for grease recovery units. Start and run units through complete sequence of operations.

3.9 ADJUSTING

A. Adjust operation and correct deficiencies discovered during commissioning.

3.10 DEMONSTRATION

A. Train Owner’s maintenance personnel on procedures related to startup and servicing of interceptors.

3.11 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following types of water distribution pumps for plumbing systems:
   1. In-line circulators.

1.2 PUMP PERFORMANCE REQUIREMENTS

A. Pump Pressure Ratings: At least equal to system maximum operating pressure at point where
   installed.

1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1
   Specification Sections.

B. Product data including certified performance curves, weights (shipping, installed, and operating),
   furnished specialties, and accessories. Include startup instructions.

C. Maintenance data for each type and size pump specified to include in the "Operating and
   Maintenance Manual" specified in Section "Closeout Procedures."

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with provisions of the following:
   1. ASME B31.9 “Building Services Piping” for piping materials and installation.
   2. H.I. “Hydraulic Institute Standards for Centrifugal, Rotary and Reciprocating Pumps” for pump
      design, manufacture, and installation.
   3. UL 778 “Standard for Motor Operated Water Pumps” for construction requirements. Include
      UL listing and labeling.
   4. NEMA MG 1 “Standard for Motors and Generators” for electric motors. Include NEMA
      listing and labeling.
   5. NFPA 70 “National Electrical Code” for electrical components and installation.

B. Single-Source Responsibility: Obtain same type of pumps from a single manufacturer.

C. Design Criteria: Drawings indicate sizes, profiles, connections, and dimensional requirements of
   pumps and are based on specific manufacturer types and models indicated. Pumps having equal
   performance characteristics by other manufacturers may be considered provided that deviations in
   dimensions and profiles do not change the design concept or intended performance as judged by the
   Architect. The burden of proof for equality of pumps is on the proposer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pumps in a clean, dry location.

B. Retain shipping flange protective covers and protective coatings during storage.
C. Protect bearings and couplings against damage from sand, grit, or other foreign matter.

D. Extended Storage Greater than 5 Days: Dry internal parts with hot air or a vacuum-producing device. After drying, coat internal parts with light oil, kerosene, or antifreeze. Dismantle bearings and couplings, dry and coat with an acid-free heavy oil, and tag and store in a dry location.

E. Comply with pump manufacturer’s rigging instructions for handling.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. All-Bronze, In-Line Circulators:
   a. Amtrol, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Div., ITT Fluid Technology Corp.
   d. Dunham-Bush, Inc.
   e. Grundfos Pumps Corp.
   f. Taco, Inc.

2.2 PUMPS, GENERAL

A. Water Distribution Pumps: Factory assembled and tested.

B. Capacities and Characteristics: As indicated.

C. Motors: NEMA MG 1; single, multiple, or variable speed with type of enclosure and electrical characteristics indicated. Include built-in thermal-overload protection and grease-lubricated ball bearings. Motors are non-overloading within full range of pump performance curves.

D. Finish: Manufacturer’s standard paint applied to factory-assembled and factory-tested plumbing pump units before shipping.

E. Manufacturer’s Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

2.3 IN-LINE CIRCULATORS

A. General Description: Horizontal, in line, centrifugal, single stage, rated for 125-psig (860-kPa) minimum working pressure and 225 DegF (107 DegC) continuous water temperature.

B. All-Bronze, In-Line Circulator: Horizontal, in line, centrifugal, single stage, all bronze, with radially split case design:

1. Casing: Bronze, with threaded companion flanges for piping connections smaller than 2-1/2 inches (65 mm), and threaded gage tappings at inlet and outlet connections.
2. Impeller: ASTM B584, cast bronze, statically and dynamically balanced, closed, overhung, single suction, and keyed to shaft.
4. Shaft and Sleeve: Steel shaft with oil-lubricated copper sleeve.
5. Mechanical Seals: Carbon steel rotating ring, stainless-steel spring, ceramic seat, and flexible bellows and gasket.
8. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

C. Compact, In-Line Circulator: Leakproof, in-line, sealless, volute-type pump. Include pump and motor assembled on a common shaft in a hermetically sealed unit, without stuffing boxes or mechanical seals. Lubricate sleeve bearing and cool motor by circulating pumped liquid through motor section. Isolate motor section from motor stator windings with a corrosion-resistant, nonmagnetic alloy liner:
1. Casing: Cast bronze, with stainless-steel liner and static O-ring seal to separate motor section from motor stator, and flanged piping connections.
2. Casing: Cast iron, with stainless-steel liner and static O-ring seal to separate motor section from motor stator, and flanged piping connections.
3. Impeller: Overhung, single-suction, closed or open nonmetallic impeller.
4. Shaft and Sleeve: Stainless-steel shaft with carbon-steel bearing sleeve.

2.4 GENERAL-DUTY VALVES

A. Refer to other Sections for general-duty gate, ball, butterfly, globe, and check valves.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment foundations, and conditions with Installer present for compliance with requirements for installation and other conditions affecting performance of plumbing pumps. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Examine roughing-in of plumbing piping systems to verify actual locations of piping connections prior to pump installation.

3.2 INSTALLATION

A. Install pumps according to the manufacturer’s written installation instructions.

B. Install pumps in locations indicated and arrange to provide access for periodic maintenance, including removal of motors, impellers, couplings, and accessories.

C. Support pumps and piping so that weight of piping is not supported by pumps.
D. Suspend horizontal, in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support weight of pumps. Fabricate brackets or supports as required for pumps.

E. Suspend vertical, in-line pumps independent from piping. Use continuous-thread hanger rods and vibration isolation hangers of sufficient size to support weight of pumps.

3.3 CONNECTIONS

A. Connect piping to pumps as indicated. Install valves that are same size as piping connecting to pumps.

B. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

C. Install shutoff valve and strainer on suction side of in-line pumps and circulators.

D. Install check valve and throttling valve on discharge side of in-line pumps and circulators.

E. Install flexible pipe connectors on suction and discharge of end-suction pumps. Install flexible pipe connectors upstream from pump suction diffusers and strainers, and between pump casings and discharge valves.

F. Install pressure gages on suction and discharge of each pump. Install at integral pressure gage tappings where provided.

G. Install pressure gage connector plugs in suction and discharge piping around pumps. Pressure gage connector plugs are specified in other Sections.

H. Install electrical connections for power, controls, and devices.

I. Electrical power and control wiring and connections are specified in other Sections.

3.4 FIELD QUALITY CONTROL

A. Check suction piping connections for tightness to avoid drawing air into pumps.

B. Clean strainers on pump suction piping.

C. Pump Controls: Set pump controls for automatic start, stop, and alarm operation.

3.5 COMMISSIONING

A. Final Checks Before Startup: Perform the following preventive maintenance operations and checks before startup:
   1. Disconnect couplings and check motors for proper rotation. Rotation shall match direction of rotation marked on pump casing.
   2. Check that pumps are free to rotate by hand. Pumps for handling hot liquids shall be free to rotate with pump hot and cold. Do not operate pump if bound or if it drags even slightly until cause of trouble is determined and corrected.
   3. Check that pump controls are correct for required application.
B. When pumps are to be started against closed check valves with discharge gate valves open, steps are same except open discharge gate valves some time before motors are started.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
A. This Section includes drainage and vent piping systems to a point 5 feet outside the building. Systems include the following:
   1. Sanitary and storm drainage and vent systems.

1.2 SYSTEM PERFORMANCE REQUIREMENTS
A. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:

1.3 SUBMITTALS
A. Coordination drawings, drawn accurately to scale and coordinating penetrations.

1.4 QUALITY ASSURANCE
A. Comply with the provisions of ASME B31.9 “Building Services Piping” for materials, products, and installation.
B. Provide listing/approval stamp, label, or other marking on piping made to specified standards.

PART 2 – PRODUCTS

2.1 PIPES AND TUBES
A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article “Pipe and Fittings Applications.”
B. Hard Copper Tube: ASTM B88, Types L, water tube, drawn temper.
C. Soft Copper Tube: ASTM B88, Types K, water tube, annealed temper.
D. Copper Drainage Tube: ASTM B306, Type DWV, drawn temper.
E. Hub and Spigot, Cast-Iron Soil Pipe: ASTM A74, Service Class.
F. Hubless, Cast-Iron Soil Pipe: CISPI 301.

2.2 PIPE FITTINGS AND TUBE FITTINGS
A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.
C. Wrought-Copper, Solder-Joint, Drainage Fittings: ASME B16.29.
D. Cast-Copper-Alloy, Solder-Joint, Drainage Fittings: ASME B16.23.

E. Bronze Flanges: ASME B16.24, Class 150.

F. Hub and Spigot, Cast-Iron Soil Pipe Fittings: ASTM A74, Service Class.

G. Hubless, Cast-Iron Soil Pipe Fittings: CISPI 301.

2.3 JOINING MATERIALS

A. Solder, brazing, and welding filler metals are specified in other Sections.

B. Cast-Iron Soil Pipe and Fittings: ASTM C564 neoprene rubber gaskets and lubricant.


2.4 VALVES

A. Valves are specified in other Sections.

PART 3 – EXECUTION

3.1 EXCAVATION

A. Excavation, trenching, and backfilling are specified in other Sections.

3.2 PREPARATION OF FOUNDATION FOR BURIED PIPING

A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.

B. Remove unstable, soft, and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.

C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig bell holes at each pipe joint to relieve bells of loads and to ensure continuous bearing of pipe barrel on foundation.

3.3 PIPE AND FITTINGS APPLICATIONS

A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.

B. Soil, Waste, and Vent Piping Below Ground: Use the following:

C. Soil, Waste, and Vent Piping Above Ground: Use the following:
   1. All: Hubless cast-iron soil pipe, hubless cast-iron soil pipe fittings, CISPI-type couplings for hubless cast-iron soil pipe and fittings, and hubless joints.
2. 1-1/4 to 4 Inches: Copper drainage tube, wrought-copper or cast-copper-alloy drainage fittings, and soldered joints with Alloy E solder.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use gate, ball, or butterfly valves.
   2. Throttling Duty: Use globe, ball, or butterfly valves.

3.5 PIPING INSTALLATION, GENERAL

A. Basic piping installation requirements are specified in other Sections.

3.6 SERVICE ENTRANCE PIPING

A. Extend building sanitary drain piping and connect to sanitary sewer piping of size and in location indicated for service entrance to building. Install cleanout and extension to grade at connection of building sanitary drain and building sanitary sewer. Sanitary sewerage piping is specified in other Sections.

3.7 DRAINAGE AND VENT PIPING INSTALLATION


B. Make changes in direction for drainage and vent piping using appropriate Y branches, Y branches with 1/8 bends, and long-sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short-sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is from horizontal to vertical. Use long-turn double-Y-branch and 1/8-bend fittings where two (2) fixtures are installed back to back or side by side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

C. Lay buried building drains beginning at low point of each system, true to grades and alignment indicated, with unbroken continuity of invert. Place hub or bell ends of piping facing upstream. Install required gaskets according to manufacturer’s recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in piping and pull past each joint as completed.

D. Install drainage and vent piping at the following minimum slopes, except where another slope is indicated:
   1. Sanitary Building Drain: 1/4 inch per foot (2 percent) for piping 3 inches and smaller; 1/8 inch per foot (1 percent) for piping 4 inches and larger.
   2. Horizontal Sanitary Drainage Piping: 1/4 inch per foot (2 percent).
   3. Vent Piping: 1/8 inch per foot (1 percent).

E. Sleeves are not required for cast-iron soil pipes passing through concrete slab, without membrane waterproofing, on grade.
3.8 JOINT CONSTRUCTION

A. Basic piping joint construction is specified in other Sections

   1. Compression Joint: Make with neoprene gasket matching class of pipe and fittings.
   2. Hubless Joint: Make with neoprene gasket and sleeve or clamp.

3.9 INSTALLATION OF VALVES

A. Install valves for duty indicated, where indicated.

B. Shutoff Valves: For shutoff valves 2 inches and smaller, use gate or ball valves; for shutoff valves 2-1/2 inches and larger, use gate or butterfly valves.

C. Drain Valves: Install drain valves on each plumbing equipment item located to drain equipment for service and repair.

D. Check Valves: Install swing check valve on discharge side of each pump and elsewhere as indicated. Use MSS SP-80, Class 125, cast-bronze body for 2-inch and smaller piping and MSS SP-71, Class 125, cast-iron body for 2-1/2-inch and larger piping.

3.10 HANGERS AND SUPPORTS INSTALLATION

A. Hanger and support devices are specified in other Sections.

3.11 CONNECTIONS

A. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts, with approved trap, of sizes indicated, but not smaller than required by plumbing code, to plumbing fixtures and drains.

B. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.12 FIELD QUALITY CONTROL

A. Inspect drainage piping as follows:
   1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
   2. During progress of installation, notify the plumbing official having jurisdiction at least 24 hours prior to time such inspection must be made. Perform tests specified below in presence of the plumbing official.
      a. Roughing-In Inspection: Arrange for inspection of piping system after system roughing-in, before concealing, and prior to setting fixtures.
      b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
   3. Reinspections: Make required corrections and arrange for reinspection by plumbing official when piping system fails to pass test or inspection.
   4. Reports: Prepare inspection reports signed by the plumbing official.
B. Drainage and Vent Piping System Tests: Test drainage and vent systems according to procedures of authority having jurisdiction or, in absence of published procedure, as follows:

1. Test for leaks and defects in new drainage and vent piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.

2. Leave uncovered and unconcealed in new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.

3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open-jointed drain tile, test piping of plumbing drainage and venting systems on completion of roughing-in piping installation. Tightly close all openings in piping system and fill with water to point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and their traps filled with water, test connections and prove gastight and watertight. Plug stack openings on roof and building drain where it leaves the building and introduce air into the system equal to pressure of 1-inch water column. Use a U tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

6. Prepare reports for tests and required corrective action.

3.13 CLEANING

A. Clean interior of piping system. Remove dirt and debris as work progresses.

3.14 COMMISSIONING

A. Check plumbing equipment and verify proper settings, adjustments, and operation.

B. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.15 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day or when work stops.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
A. This Section includes electric water heaters and accessories.

1.2 SUBMITTALS
A. General: Submit each item in this Article according to the Conditions of the Contract.
B. Product Data including rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate dimensions, finishes and coatings, required clearances, methods of assembly of components, and piping and wiring connections.
C. Wiring diagrams from manufacturers detailing electrical requirements for electrical power supply wiring to water heaters. Include ladder-type wiring diagrams for interlock and control wiring required for final installation of water heaters and controls. Differentiate between factory-installed and field-installed wiring.
D. Product certificates signed by manufacturers of water heaters certifying that their products comply with specified requirements.
E. Certificates of shop inspection and data report as required by provisions of ASME Boiler and Pressure Vessel Code, when ASME construction is indicated.
F. Field quality-control installation reports.
G. Maintenance data for water heaters to include in operation and maintenance. Include startup instructions.

1.3 QUALITY ASSURANCE
C. Listing and Labeling: Provide electrically operated water heaters, controls, and components specified in this Section that are listed and labeled.
   1. The Terms “Listed” and “Labeled”: As defined in National Electrical Code, Article 100.
D. Product Options: Drawings indicate size, profiles, connections, dimensional requirements, and characteristics of water heaters and accessories and are based on specific types and models indicated. Other manufacturers’ water heaters and accessories with equal performance characteristics may be considered.

1.4 WARRANTY
A. General Warranty: The special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and shall be in addition to, and
run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

B. Warranty Period: Five (5) years after date of Substantial Completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Commercial, Storage, Electric Water Heaters:
      a. Bradford White Corp.
      b. Lochinvar Corp.
      c. Patterson-Kelley Co.
      d. PVI Industries, Inc.
      g. Smith: A.O. Smith Water Products Co.
      h. State Industries, Inc.

2.2 WATER HEATERS, GENERAL

A. Specified manufacturer’s standard components and features are acceptable where specific product requirements are not indicated.

B. Temperature Control: Adjustable thermostat, except for units where other arrangement is indicated or temperature is regulated by flow-control fitting.

C. Safety Control: Automatic, high-temperature-limit cutoff device or system on commercial units and where indicated. Include automatic low-water cutoff device or system on commercial units where indicated.

D. Interior Finish: Materials that comply with requirements of applicable NSF, AWWA, or FDA and EPA regulatory standards for tasteless and odorless, potable-water-tank linings.

E. Tappings: Factory fabricated of materials compatible with tank. Include tappings for piping connections, relief valves, pressure gage, thermometer, blow down, and controls as required and others as indicated. Attach tappings to tank before testing and labeling. Include tappings and connections as follows:
   1. 2-Inch NPS (DN50) and Smaller: Threaded ends.

F. Insulation: Fiberglass, polyurethane foam, or manufacturer’s standard that is suitable for operating temperature and required insulating value. Include insulation material that surrounds entire tank except connections and controls.

G. Jacket: Steel, with baked-on enamel finish, except where otherwise specified.

H. Anode Rods: Factory installed, magnesium.

I. Combination Temperature and Pressure Relief Valve: ASME rated and stamped and complying with ASME PTC 25.3. Include relieving capacity at least as great as heat input and pressure setting less
than water heater working-pressure rating. Select relief valve with sensing element that extends into tank.

1. Option: Separate temperature and pressure relief valves are acceptable instead of combination relief valve.

2.3 COMMERCIAL, STORAGE, ELECTRIC WATER HEATERS

A. Description: UL 1453, commercial, storage, electric water heater; with capacity more than 40 gallons (151 L).

B. Storage Tank Construction: ASME labeled, steel with 150-psig (1035-kPa) working-pressure rating when indicated.

C. Storage Tank Construction: Steel with 150-psig (1035-kPa) working-pressure rating.

D. Heating Elements: Electric, screw-in or bolt-on, immersion type according to the following:
   1. More than 9-kW Input: Elements arranged in multiples of three (3).

E. Heating Elements: Electric, screw-in or bolt-on, immersion type arranged in multiples of three (3).

F. Staging: Not exceeding 18 kW per step.

G. Temperature Control: Adjustable immersion thermostats.


I. Special Requirements: NSF 5 construction.

J. Inlet and Outlet Manifolds: Fabricated by water heater manufacturer and capable of providing balanced flow through water heaters, for multiple-unit installation.

K. Vacuum Relief Valve: Comply with ASME PTC 25.3. Furnish for installation in piping.
   1. Exception: Omit where water heater has integral vacuum relieving device.

PART 3 – EXECUTION

3.1 CONCRETE BASES

A. Install concrete bases of dimensions indicated for water heaters and accessories.

3.2 WATER HEATER INSTALLATION

A. General: Install water heaters on concrete bases. Set and connect units according to manufacturer’s written instructions. Install units plumb, level, and firmly anchored in locations indicated. Maintain manufacturer’s recommended clearances. Install so controls and devices are accessible for service.

B. Anchor water heaters and storage tanks to substrate.

C. Install seismic restraints as indicated.
D. Install temperature and pressure relief valves in top portion of storage water heater tanks and hot-water storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge to closest floor drain.

E. Install vacuum relief valves in cold-water-inlet piping.

F. Install vacuum relief valves in water heaters and hot-water storage tanks that have copper lining.

G. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains.

H. Install thermometers on water heater inlet and outlet piping.

I. Install pressure gages on water heater piping when and as indicated.

J. Install inlet and outlet piping manifolds for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through water heaters. Include throttling valves in outlet manifolds and thermometers in inlet and outlet manifolds.

K. Install piping adjacent to water heaters to allow service and maintenance.

L. Arrange for field-applied insulation on equipment and piping not furnished with factory-applied insulation.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Connect hot- and cold-water piping to units with shutoff valves and unions. Connect hot-water circulating piping to unit with shutoff valve, check valve, and union.

2. Make connections with dielectric fittings where piping is made of dissimilar metals. Dielectric fittings are specified in other Sections.

B. Electrical Connections: Power wiring and disconnect switches are specified in other Sections. Arrange wiring to allow unit servicing.

C. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 COMMISSIONING

A. Startup Services: Engage a factory-authorized service representative to provide startup service and to demonstrate and train Owner’s maintenance personnel as specified below.

1. Test and adjust operating and safety controls. Replace damaged and malfunctioning controls and equipment.

2. Train Owner’s maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in the operation and maintenance manuals.

4. Schedule training with Owner with at least 7 days of advance notice.

B. Perform the following final checks before startup:
1. Fill water heaters with water.
2. Check that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Check operation of pumps and circulators.
6. Test operation of safety controls, relief valves, and devices.

C. Perform the following startup procedures:
   1. Energize electric circuits.
   2. Adjust operating controls.
   3. Adjust hot-water-outlet temperature settings.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes plumbing fixtures and trim, fittings, and accessories, appliances, appurtenances, equipment, and supports associated with plumbing fixtures.

1.2 SUBMITTALS

A. Product data for each type of plumbing fixture specified, including fixture and trim, fittings, accessories, appliances, appurtenances, equipment, supports, construction details, dimensions of components, and finishes.

B. Wiring diagrams for field-installed wiring of electrically operated units.

C. Maintenance Data: For plumbing fixtures to include in maintenance manuals.

1.3 QUALITY ASSURANCE


B. Listing and Labeling: Provide electrically operated fixtures specified in this Section that are listed and labeled.

1. Regulatory Requirements: The terms “listed” and “labeled” shall be as defined in the National Electrical Code, Article 100.


E. NSF Standard: Comply with NSF 61, “Drinking Water System Components – Health Effects,” for fixture materials that will be in contact with potable water.

F. Design Concept: The drawings indicate types of plumbing fixtures and are based on the specific descriptions, manufacturers, models, and numbers indicated. Plumbing fixtures having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions, operation, color or finish, or other characteristics are minor and do not change the design concept or intended performance as judged by the Owner’s Representative. Burden of proof for equality of plumbing fixtures is on the proposer.

1.4 DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
B.  Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.5 EXTRA MATERIALS

A.  Deliver extra materials to Owner. Furnish extra materials described below matching products installed, packaged with protective covering for storage, and identified with labels clearly describing contents.

1. Faucet Washers and O-rings: Furnish quantity of identical units not less than 10 percent of amount of each installed.
2. Faucet Stops: Furnish quantity of identical units not less than 10 percent of amount of each installed.
3. Supply Stops: Furnish quantity of identical units not less than 5 percent of amount of each installed.
4. Flushometer Repair Kits: Furnish quantity of identical units not less than 10 percent of amount of each flushometer installed.
5. Provide a hinged-top wood or metal box, or individual metal boxes, having a separate compartment for each type and size of above extra materials.
6. Water Closet Tank Repair Kits: Furnish quantity of identical flush valve units not less than 5 percent of amount of each type installed.
7. Toilet Seats: Furnish quantity of identical units not less than 5 percent of amount of each type toilet seat installed.
8. Filter Cartridges: Furnish quantity of identical filter cartridges not less than 50 percent of amount of each type and size installed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A.  Manufacturers: Subject to compliance with requirements, provide products in each category, by one of the following listed for that category:

1. Water Closets:
   a. American Standard, Inc.
   b. Kohler Co.
   c. Sloan
2. Urinals:
   a. American Standard, Inc.
   b. Kohler Co.
   c. Sloan
3. Lavatories:
   a. American Standard, Inc.
   b. Eljer; A Household International Co.
   c. Kohler Co.
4. Sinks:
   a. American Standard, Inc.
   b. Crane Plumbing/Fiat Products.
   c. Eljer; A Household International Co.
   d. Elkay Manufacturing Co.
e. Kohler Co.
f. Moen Group; Stanadyne Corp.
g. Universal-Rundle Corp.

5. Service Sinks:
a. American Standard, Inc.
b. Crane Plumbing/Fiat Products.
c. Eljer; A Household International Co.
d. Elkay Manufacturing Co.
e. Kohler Co.
f. Universal-Rundle Corp.

6. Mop Basins:
a. Aqua Glass Corp.
b. Crane Plumbing/Fiat Products.
c. Florestone Products Co., Inc.
d. Stern-Williams Co., Inc.
e. Swan Corp.

7. Drinking Fountains:
a. American Standard, Inc.
b. Eljer; A Household International Co.
c. Haws Drinking Faucet Co.
d. Kohler Co.

8. Water Coolers:
a. Elkay Manufacturing Co.
b. Haws Drinking Faucet Co.
c. Sunroc Corp.
d. Western Drinking Fountains; Sunroc Corp.

9. Toilet Seats:
c. Church Seat Co.
d. Olsonite Corp.

10. Flushometers:
a. Coyne & Delany Co.
b. Sloan Valve Co.

11. Commercial/Industrial Cast-Brass Faucets:
a. American Standard, Inc.
b. Chicago Faucet Co.
c. Crane Plumbing/Fiat Products.
d. Eljer; A Household International Co.
e. Kohler Co.
g. Speakman Co.
h. T & S Brass and Bronze Works, Inc.

12. Commercial/Residential Cast-Brass and Cast-Brass Underbody Faucets:
a. American Standard, Inc.
b. Chicago Faucet Co.
c. Crane Plumbing/Fiat Products
d. Delta Faucet Co.; Div. of Masco Corp.
e. Eljer; A Household International Co.
f. Elkay Manufacturing Co.
g. Kohler Co.
h. Moen Group; Stanadyne Corp.
i. Price Pfister, Inc.
k. Speakman Co.
l. Symmons Industries, Inc.
m. T&S Brass and Bronze Works, Inc.

13. Miscellaneous Fittings (Except Faucets):
   a. Aquaflo Corp.
   c. Brass Craft Subsidiary; Masco Co.
   d. Bridgeport Plumbing Products, Inc.
   e. Central Brass Manufacturing Co.
   f. Chicago Faucet Co.
   g. Connecticut Stamping & Bending Co.
   h. Crane Plumbing/Fiat Products.
   i. Eljer; A Household International Co.
   j. Kohler Co.
   k. McGuire Manufacturing Co., Inc.
   l. Price Pfister, Inc.
   m. Royal Brass Mfg. Co.
   n. Sanitary-Dash Manufacturing Co., Inc.
   o. T&S Brass and Bronze Works, Inc.
   p. Teledyne Ansonia.

14. Supports:
   a. Ancon, Inc.
   b. Josam Co.
   d. Wade Div.; Tyler Pipe.
   e. Zurn Industries, Inc.; Hydromechanics Div.

15. Disposers:
   a. General Electric Co.
   b. Hotpoint; General Electric Co.
   c. In-Sink-Erator Div.; Emerson Electric Co.
   d. Jenn-Air Co.
   e. KitchenAid, Inc.
   f. Thermador/Waste King; A Masco Co.

2.2 FAUCETS

A. Faucets General: Unless otherwise specified, provide faucets that are cast brass with polished chrome-plated finish.
B. Lavatory Faucets: ASME A112.18.1M.
C. Sink Faucet: ASME A112.18.1M.
D. Service Sink Faucet: ASME A112.18.1M, rough chrome finish, cast brass, with stops in shanks, and wall brace, integral vacuum breaker, pail hook, and garden hose thread on spout.
E. Mop Basin Faucet: ASME A112.18.1M, rough chrome finish, cast brass, with stops in shanks; wall brace, integral vacuum breaker, pail hook, and garden hose thread on spout; and hose and bracket.

2.3 FITTINGS, EXCEPT FAUCETS

A. Fittings General: Unless otherwise specified, provide fittings fabricated of brass, with a polished chrome plated finish.
C. Lavatory Traps: Cast-brass, 1-1/4-inch NPS adjustable P-trap with cleanout, 17-gage tubular waste to wall, and wall flange.
D. Sink Supplies and Stops: Loose-key angle stop, having 1/2-inch NPS inlet with wall flange and 1/2-inch by 12-inch flexible tubing riser outlet.
E. Sink Traps: Cast-brass, 1-1/2-inch or 2-inch NPS adjustable P-trap with cleanout, 17-gage tubular waste to wall, and wall flange.
F. Sink Continuous Wastes: Polished chrome-plated, tubular brass, 1-1/2 inches or 2 inches, 17-gage, with brass nuts on slip inlets, and of configurations indicated.
G. Water Closet Supplies and Stops: Loose-key angle stop, having 1/2-inch NPS inlet with wall flange and 1/2-inch by 12-inch flexible tubing riser outlet with collar.
H. Urinal Traps: 1-1/2-inch NPS adjustable P-trap with cleanout, 17-gage tubular waste to wall, and wall flange.
I. Fittings installed concealed inside a plumbing fixture or within wall construction may be without chrome plate finish.
J. Escutcheons: Polished chrome-plated, sheet steel wall flange with friction clips.
K. Deep Pattern Escutcheons: Wall flange with set screw or sheet steel wall flange with friction clips of depth adequate to conceal protruding roughing-in fittings.

2.4 FLUSHOMETERS

A. Provide flushometers compatible with fixtures, with features and of consumption indicated.
B. Construction: Cast-brass body, brass or copper pipe or tubing inlet with wall flange and tailpiece with spud, screwdriver check stop, vacuum breaker, and brass lever handle actuation except where other variations are specified. Type shall be diaphragm operation except where other type is specified.
C. Finish: Exposed metal parts shall be polished chrome-plated, except components installed in a concealed location may be rough brass or unfinished.

2.5 TOILET SEATS

A. General: Provide toilet seats compatible with water closets, and of type, color, and features indicated.

B. Toilet Seats: Extra heavy-duty, commercial/industrial type, elongated, open front, solid plastic with check hinge.

2.6 DISPOSERS

A. Disposers: Continuous-feed-type food waste disposer conforming to UL 430, 1/2-horsepower motor, 1725 rpm, overload protection, and wall-switch operated; corrosion-resistant construction, with quick-mounting feature, stainless steel sink flange, cushioned suspension, and stainless steel grinding chamber; jam-resistant cutting/shredding mechanism with swivel-mounted impellers on turntable, cast tool steel grinding ring, and cutlery steel undercut blade; insulated housing for grinding chamber; and anti-splash guard and combination cover/stopper.

2.7 PLUMBING FIXTURE SUPPORTS

A. Supports: ASME A112.6.1M, categories and types as required for wall-hanging fixtures specified, and wall reinforcement.

B. Support categories are:
   1. Carriers: Supports for wall-hanging water closets and fixtures supported from wall construction. Water closet carriers shall have an additional faceplate and coupling when used for wide pipe spaces. Provide tiling frame or setting gage with carriers for wall-hanging water closets.
   2. Chair Carriers: Supports with steel pipe uprights for wall-hanging fixtures. Urinal chair carriers shall have bearing plates.
   3. Chair Carriers, Heavy Duty: Supports with rectangular steel uprights for wall-hanging fixtures.
   4. Reinforcement: 2-inch by 4-inch wood blocking between studs or 1/4-inch by 6-inch steel plates attached to studs, in wall construction, to secure floor-mounted and special fixtures to wall.

C. Support Types: Provide support of category specified, of type having features required to match fixture.

D. Provide supports specified as part of fixture description, in lieu of category and type requirements above.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer’s roughing-in data if roughing-in data are not indicated.

B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 APPLICATION

A. Install plumbing fixtures and specified components, in accordance with designations and locations indicated on Drawings.

B. Install supports for plumbing fixtures in accordance with categories indicated, and of type required:
   1. Carriers for following fixtures:
      a. Wall-hanging water closets.
      b. Wall-hanging fixtures supported from wall construction.
   2. Chair carriers for the following fixtures:
      a. Wall-hanging urinals.
      b. Wall-hanging lavatories and sinks.
      c. Wall-hanging drinking fountains and electric water coolers.
   3. Heavy-duty chair carriers for the following fixtures:
      a. Accessible lavatories.
      b. Fixtures where specified.
   4. Reinforcement for the following fixtures:
      a. Floor-mounted lavatories required to be secured to wall.
      b. Floor-mounted sinks required to be secured to wall.
      c. Recessed, box-mounted electric water coolers.

3.3 INSTALLATION OF PLUMBING FIXTURES

A. Install plumbing fixtures level and plumb, in accordance with fixture manufacturers’ written installation instructions, roughing-in drawings, and referenced standards.

B. Install wall-hanging, back-outlet urinals with gasket seals.

C. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.

D. Fasten floor-mounted fixtures and special fixtures having holes for securing fixture to wall construction, to reinforcement built into walls.

E. Fasten wall-mounted fittings to reinforcement built into walls.

F. Fasten counter-mounting-type plumbing fixtures to casework.

G. Secure supplies behind wall or within wall pipe space, providing rigid installation.

H. Install stop valve in an accessible location in each water supply to each fixture.

I. Install trap on fixture outlet except for fixtures having integral trap.

J. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.
K. Seal fixtures to walls, floors, and counters using a sanitary-type, one-part, mildew-resistant, silicone sealant in accordance with sealing requirements specified in other Sections. Match sealant color to fixture color.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Sections. The Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:

1. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Sections.
2. Install piping connections indicated between appliances and equipment specified in other sections, direct connected to plumbing piping systems.

3.5 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Test fixtures to demonstrate proper operation upon completion of installation and after units are water pressurized. Replace malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.6 ADJUSTING AND CLEANING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust disposers, hot water dispensers, and controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at drinking fountains, electric water coolers, and faucets, shower valves, and flushometers having controls, to provide proper flow and stream.

D. Replace washers of leaking and dripping faucets and stops.

E. Clean fixtures, fittings, and spout and drain strainers with manufacturers’ recommended cleaning methods and materials.

F. Review the data in Operating and Maintenance Manuals.

3.7 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of fixtures for temporary facilities, except when approved in writing by the Owner.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes general administrative and procedural requirements for all HVAC work. The administrative and procedural requirements included in this Section are to expand the requirements specified elsewhere.

1.2 SCOPE OF WORK

A. Provide all labor, material, equipment, and services necessary for and incidental to completion of all work as indicated on the Drawings and/or as specified herein. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, sleeves, inserts, anchor bolts, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete and workable systems.

1.3 DRAWING USE AND INTERPRETATION

A. Unless indicated by specific dimensions, drawings are meant to be diagrammatic. Exact equipment locations and routing of utilities shall be governed by field conditions and/or Owner’s Representative’s instructions.

B. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as result of the failure to check or verify dimensions, measurements, etc., shall be corrected.

C. The drawings show the general arrangement of utilities, equipment, and accessories. Drawings do not indicate all offsets, fittings, accessories, and changes in elevation, which may be necessary. Make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in contract price. Provide offsets, fittings, and accessories as may be required to meet such conditions.

1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

   a. The words “shall be” are implied where a colon (:) is used within a sentence or phrase.
1.5 DEFINITIONS

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

B. Indicated: The term “indicated” refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as “shown,” “noted,” “scheduled,” and “specified” are used, it is to help the reader locate the reference; no limitation on location is intended.

C. Directed: Terms such as “directed,” “requested,” “authorized,” “selected,” “approved,” “required,” and “permitted” mean “directed by the Engineer,” “requested by the Engineer,” and similar phrases.

D. Approved: The term “approved,” where used in conjunction with the Engineer’s action on the Contractor’s submittals, applications, and requests, is limited to the Engineer’s duties and responsibilities as stated in the Conditions of the Contract.

E. Regulations: The term “Regulations” includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. Furnish: The term “furnish” is used to mean “supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.”

G. Install: The term “install” is used to describe operations at project site including the actual “unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.”

H. Provide: The term “provide” means “to furnish and install, complete and ready for the intended use.”

I. Installer: An “installer” is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
   1. The term “experienced,” when used with the term “installer,” means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
   2. Trades: Use of titles such as “carpentry” is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as “carpenter.” It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.
   3. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility of fulfilling Contract requirement remains with the Contractor.
      a. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

J. The term “concealed”: embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.
K. The term “exposed”: not installed underground or concealed. Equipment in rooms with exposed construction (i.e., mechanical rooms, electrical rooms, janitor’s closets, etc.) are classified as exposed.

L. The term “piping”: piping fittings, flanges, valves, controls, hangers, traps, drains, insulation and items necessary or required in connection with or relating thereto.

M. The “Project Site” is the space available to the contractor for performance of construction activities, either exclusively or in conjunction with other performing other work as part of the Project.

N. Testing Laboratories: A “testing laboratory” is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.6 COMPLETE SYSTEMS

A. General: Provide all materials as required for complete systems, including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation prior to Owner’s acceptance.

B. Systems: The systems specified and/or shown on the Drawings are for complete and workable systems. Any deviation from these systems due to a particular manufacturer’s requirements shall be made at no additional cost to the Owner.

1.7 CODES AND REGULATIONS

A. General: Comply with all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities. Contractor shall be required to contact state regulated “call before you dig” service prior to any excavation work.

C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.8 REFERENCE STANDARDS

A. All published standards of the following associations/organizations, as mandated by specific state standards, shall be followed and applied as a minimum.
   1. AABC, Associated Air Balance Council
   2. ACI, American Concrete Institute
   3. AGA, American Gas Association.
   4. AIA, The American Institute of Architects
   5. AISC, American Institute of Steel Construction
   6. AMCA, Air Movement and Control Assoc.
   7. ANSI, American National Standards Institute
   8. API, American Petroleum Institute
   9. ARI, Air-Conditioning and Refrigeration Institute
   10. ASHRAE, American Society of Heating, Refrigerating and Air-Conditioning Engineers
11. ASME, American Society of Mechanical Engineers
12. ASPE, American Society of Plumbing Engineers
13. ASSE, American Society of Sanitary Engineering
14. ASTM, American Society for Testing and Materials
15. AWS, American Welding Society
16. AWWA, American Water Works Assoc.
17. CAGI, Compressed Air and Gas Institute
18. CGA, Compressed Gas Assoc.
19. CISPI, Cast Iron Soil Pipe Institute
20. DIPRA, Ductile Iron Pipe Research Assoc.
21. ETL, ETL SEMKO a Division of Intertek Group
22. FMG, Factory Mutual Global
23. GE-GAP, General Electric Global Assets Protection
24. HEI, Heat Exchange Institute
25. HI, Hydronics Institute
26. ISA, Instrument Society of America
27. MCAA, Mechanical Contractors Association of America
28. MSS, Manufacturers Standardization Society
29. NACE, National Association of Corrosion Engineers International
30. NADCA, National Air Duct Cleaners Association
31. NEC, National Electrical Code (from NFPA)
32. NECA, National Electrical Contractors Assoc.
33. NEMA, National Electrical Manufacturers Assoc.
34. NFPA, National Fire Protection Assoc.
35. NSF, National Sanitation Foundation
36. PDI, Plumbing and Drainage Institute
37. SMACNA, Sheet Metal and Air Conditioning Contractors
38. SSPMA, Sump and Sewage Pump Manufacturers Assoc.
39. STI, Steel Tank Institute
40. SWPA, Submersible Wastewater Pump Assoc.
41. UL, Underwriters Laboratories Inc.
42. WSC, Water Systems Council

B. Federal Government Agencies: Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.
1. EPA, Environmental Protection Agency.
2. NIST, National Institute of Standards and Technology (U.S. Department of Commerce).
3. OSHA, Occupational Safety and Health Administration (U.S. Department of Labor).

C. Applicability of Standards: Except where 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. Such standards are made a part of the Contract Documents by reference.
D. Copies of Standards: Each entity engaged in construction on the project is required to be familiar with industry standards applicable to that entity’s construction activity. Copies of applicable standards are not bound with the Contract Documents. Where copies of standards are needed for performance of a required construction activity, the contractor shall obtain copies directly from the publication source.

1.9 QUALITY ASSURANCE

A. Manufacturers’ Qualifications: Not less than five years of experience in the actual production of the specified products.

B. Installers’ Qualifications:
   1. Firm with not less than five years of experience in the installation of mechanical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.
   2. Painting, patching, carpentry, and the like related to or required for Division 23 work shall be performed by craftsmen skilled in the appropriate trade.
   3. All welding shall be performed by ASME-certified welders.

1.10 INSPECTIONS

A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all work installed under this Contract, in accordance with the Conditions of the Contract.

B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.

C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.

PART 2 – PRODUCTS

2.1 GENERAL

A. Where Specified: Materials and equipment shall be as specified in subsequent sections of the Project Manual and/or as indicated on the Drawings.

B. General: All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

C. Acceptable Products: The product will be acceptable only when that product complies with all requirements of the Contract Documents as determined by the Engineer.

D. Common Items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.

E. Listing: All materials and equipment shall be Underwriters’ Laboratories (UL) or ETL SEMKO (ETL) listed and labeled where UL or ETL standards and listings exist for the specified materials or equipment.
F. Special Tools: Provide all special tools needed for proper operation, adjustment, and maintenance of equipment.

PART 3 – EXECUTION

3.1 GENERAL

A. The installation of all mechanical work shall be in accordance with the letter and intent of the Contract Documents as determined by the Engineer.

B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty, UL, or ETL listing.

3.2 DELIVERY STORAGE AND HANDLING

A. Packing and Shipping: Deliver products in original, unopened packaging and properly identified with manufacturer’s identification and compliance labels.

B. Storage and Protection: Comply with all manufacturer’s written recommendations. Protect all equipment, materials, and work from the weather elements, paint, mortar, construction debris, and damage throughout duration of project.

C. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

3.3 EXAMINATION

A. Conditions Verification: Examine the areas and conditions under which the work is to be performed. Identify and Report any conditions detrimental to the proper and timely completion of the work to the Owner’s Representative.

3.4 DIMENSIONS

A. Building Dimensions: Exact locations of building elements shall be based on contractor’s field measurements.

B. Limiting Dimensions: Where equipment dimension and clearances are indicated on the Drawings, do not provide equipment larger than equipment dimensions or clearances specified.

C. Verify all dimensions by field measurements.

3.5 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.6 CUTTING AND PATCHING

A. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Perform cutting and patching of mechanical equipment and materials required to:
   1. Uncover Work to provide for installation of non-coordinated and/or improperly installed work.
2. Remove and replace defective Work.
3. Remove and replace Work not conforming to requirements of the Contract Documents.
4. Remove samples of installed Work as specified for testing.
5. Install equipment and materials in existing structures.
6. Uncover and restore Work to provide for Engineer observation of concealed Work.

C. Cut, remove, and legally dispose of equipment, components, and materials as indicated. Removal shall include all ancillary items associated with items removed. Remove all items made obsolete by the new work.

D. Protect the structure, furnishings, finishes, and adjacent materials not indicated to be removed.
E. Provide and maintain temporary dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
F. Patch surfaces and building components using new materials matching existing adjacent materials.

3.7 ADMINISTRATION AND SUPERVISION

A. The Contractor shall supervise the work and shall have at all times some competent person, approved by the Owner, following the work to receive instructions and to act with authority.

3.8 TESTING AND ADJUSTING

A. General: Provide testing equipment, materials, instruments, and personnel to perform all test procedures and adjustments required by the Contract Documents and/or deemed necessary by the Engineer to establish proper performance and installation of systems and equipment. All test instruments to be accurately calibrated and in good working order.

B. Scheduling: Schedule tests at least three days in advance and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational unless indicated or directed otherwise.

C. Correction/Replacement: After testing, correct any deficiencies and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken and satisfactory results of retest.

3.9 SYSTEMS DEMONSTRATION

A. Instruct the Owner’s representative(s) in the startup, operation, and maintenance of all systems and equipment in accordance with the Contract Documents.

3.10 CLEANING

A. General: Remove from the project site all waste, rubbish, and construction debris weekly unless indicated otherwise. The premises shall be left clean and free of any debris and unused construction materials, prior to final acceptance.

B. Equipment: Remove all dust, dirt, debris, mortar, rust, and other foreign materials from the interior and exterior of all equipment and enclosures, and wipe down.

C. Utilities: Thoroughly clean all utilities just prior to final inspection.
3.11 TOUCH-UP PAINTING

   A. Touch-Up Painting: Restore and refinish to original condition all surfaces of equipment scratched, marred, and/or dented during shipping, handling, or installation. Remove all rust prior to prime and paint as recommended by the manufacturer.

END OF SECTION
SECTION 23 00 04
COORDINATION WITH OTHER TRADES

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. This section describes the coordination and procedural requirements for Contractors.

B. Definitions:
   1. Owners Representative - Architect, Engineer, Construction Manager, General Contractor, Clerk of the works, or any stipulated Agent or Representative of the Owner.
   2. GC - General Contractor.
   3. MC - Mechanical Contractor/Subcontractor.
   4. PC - Plumbing Contractor/Subcontractor.
   5. EC - Electrical Contractor/Subcontractor.
   6. SM - Sheet Metal Subcontractor.
   7. SC - Sprinkler Contractor/Subcontractor.

1.2 COMPLIANCE

A. Cost incurred including those of other contractors and/or Owner due to non-compliance with this Section shall be the responsibility of the non-compliant contractor.

1.3 SUBMITTALS

A. Complete coordinated shop drawing shall be submitted in PDF and ACAD format to the Engineer for their record by the MC. Submitted coordinated shop drawing shall include all signatures required by sign off procedure.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 COORDINATION

A. General: Sequence, coordinate, and integrate the installation of all materials and equipment for efficient flow of work in conjunction with the other trades. Review and become familiar with all of the Drawings and work of all the other trades. Report and resolve any discovered discrepancies and/or interferences prior to commencing work.

B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work.

C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the work.

D. Supports and Sleeves: Coordinate the location installation of required supporting devices and sleeves to be set in concrete and other structural components, as they are constructed.
E. Right-Of-Way:
1. Adjust location of utilities, equipment, etc., to accommodate the work to prevent interferences – both anticipated and encountered.
2. Determine the exact route and location prior to fabrication.
3. Pitched piping has the right-of-way over utilities which do not pitch.
4. Furnish and install ancillary materials and equipment including but not limited to traps, air vents, drains, etc., as required to accommodate offsets, transitions, and changes in direction.

F. Headroom: Install systems, materials, and equipment to maximize headroom unless noted otherwise.

G. Utility Connections: Coordinate connection with underground and overhead utility services. Comply with requirements of governing regulations, utility providers, and controlling agencies. Provide required connection for each service.

3.2 COORDINATED SHOP DRAWINGS

A. The coordination shop drawing process shall occur in the following manner:
1. The MC shall create 3/8-inch scale AutoCAD (2010 or newer) base plans, which shall incorporate and coordinate with structural steel and ceiling system framing supports and show framing members on the shop drawings. This shall include existing building components not shown on Contract Documents.
2. The MC shall require the Sheet Metal Subcontractor to submit AutoCAD shop drawings, as expeditiously as possible, to the Engineer (through normal channels) for review and approval. The shop drawings shall incorporate all ductwork (including top and bottom of duct elevations at a maximum interval of 25 linear feet and at each elevation change), structural steel (building and miscellaneous support steel), equipment, and accessories as shown and/or specified in the contract documents.
3. All roof penetrations, wall, and floor openings shall be coordinated with the structural steel Subcontractor, Supplier, and/or Erector through the Owner’s Representative. All conflicts with structural steel members shall be resolved through the Owner’s Representative.
4. After review and final approval of the sheet metal shop drawing by the Engineer, the sheet metal Subcontractor shall incorporate all required corrections, additions, and modifications on the AutoCAD ductwork shop drawings.
5. The approved AutoCAD ductwork shop drawings shall be utilized for coordination with all other Contractors or Subcontractors whose involvement is mandated. The SM shall submit the AutoCAD ductwork shop drawings (hard copy and electronic files) to the MC to initiate the “coordination” process. The MC shall review the drawings for accuracy and completeness prior to distribution.
6. The MC shall forward with transmittal the ductwork shop drawings (hard copy and electronic files) to the PC for coordination of the plumbing work. The MC shall forward a copy of the transmittal to the Owner’s Representative.
7. The PC shall (upon receipt of drawings from the MC) superimpose his scope of work on the AutoCAD ductwork shop drawings illustrating all plumbing equipment, piping, and hangers.
8. The PC shall include invert of pipes, elevations (top and bottom) and pipe sizes including insulation at a maximum of 25-foot intervals and at each elevation change.
9. Any conflicts between the plumbing and ductwork shall be clouded by the PC on the AutoCAD ductwork shop drawing file.
10. PC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. PC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the plumbing and ductwork shall be resolved through and by the Owner’s Representative.
11. The PC and/or the SM shall correct and shall complete the AutoCAD drawings depicting all resolutions.
12. When it is ascertained that no conflicts exist between the ductwork and plumbing work, the PC shall forward the final ductwork/plumbing coordinated drawings (hard copy and electronic files) to the MC with transmittal and provide the Owner’s Representative with a copy of the transmittal.
13. The MC shall (upon receipt of drawings from the PC) superimpose all heating and air conditioning piping, equipment, hangers, and insulation including elevations (top and bottom) and pipe sizes (including insulation) on the AutoCAD drawings.
14. Any conflicts between the ductwork/plumbing/mechanical work shall be clouded by the MC on the AutoCAD shop drawing file.
15. MC shall request coordination meeting to resolve the conflicts as clouded on the coordinated shop drawings. MC shall provide clouded shop drawing at the coordination meeting. All conflicts that arise between the MC, SM, and PC shall be resolved through and by the Owner’s Representative.
16. The MC, PC, and SM shall correct and complete the AutoCAD drawings depicting all resolutions.
17. When it is ascertained that no conflicts exist between the MC, SM, and PC, the MC shall forward the final ductwork/plumbing/mechanical coordinated drawings (hard copy and electronic files) to the EC with transmittal and provide the Owner’s Representative with a copy of the transmittal.
18. The EC shall (upon receipt of drawings from the MC) superimpose all electrical equipment including but not limited to light fixtures, conduit, and hangers on the AutoCAD drawings.
19. The EC shall include elevations of light fixtures, electrical conduit, and conduit sizes.
20. Any conflicts with the ductwork/plumbing/mechanical/electrical work shall be clouded by the EC on the AutoCAD shop drawing file.
21. EC shall request coordination meeting to resolve any conflicts as clouded on the coordinated shop drawings. EC shall provide clouded coordinated shop drawing at the coordination meeting. All conflicts that arise between the EC, MC, PC, and SM shall be resolved through and by the Owner’s Representative.
22. The EC and/or the SM, PC, and MC shall correct and complete the AutoCAD drawings depicting all resolutions.
23. When it is ascertained that no conflicts exist between the EC, MC, PC, and SM, the EC shall forward the final ductwork/plumbing/mechanical/electrical coordinated drawings (hard copy and electronic file) to the SC with transmittal and provide the Owner’s Representative with a copy of the transmittal.
24. The SC shall (upon receipt of drawings from the EC) superimpose all sprinkler equipment, piping, hangers, and sprinkler heads as required by the contract documents and the appropriate codes.
25. The SC shall include elevations of piping and piping sizes.
26. Any conflicts with the ductwork/plumbing/mechanical/electrical/sprinkler work shall be clouded by the SC on the AutoCAD shop drawings.
27. The SC shall request coordination meeting to resolve any conflicts as clouded on the coordinated shop drawings. SC shall provide clouded coordinated shop drawing at the coordination meeting. All conflicts that arise between the SC, EC, MC, PC, and/or SM shall be resolved through and by the Owner’s Representative.
28. The SC and/or EC, MC, PC, and SM shall complete the AutoCAD drawings depicting all resolutions.
29. When it is ascertained that no conflicts exist between the SC, EC, MC, PC, and SM, the SC shall forward the final ductwork/plumbing/mechanical/electrical/sprinkler coordination
drawing to the MC with transmittal and provide the Owner's Representative with a copy of the transmittal.

30. Sign Off:
   a. The MC shall provide the final coordinated shop drawing to the Engineer and the Owner's Representative. The final coordinated shop drawing shall contain signatures from SM, PC, MC, EC, and SC on each sheet.
   b. Upon completion of the coordination process by all Contractors and Subcontractors as described above, they shall sign off on all drawings in ink indicating company, name, and date of sign-off and signature of company representative.
   c. Each contractor signature shall certify that each Contractor has shown their respective work on the drawings and have resolved all points of conflict and interference with other Contractors and Subcontractors.

3.3 COORDINATION MEETINGS

A. During the coordination process, separate meetings apart from project meetings concerning the progress and schedules may be called by the Owner’s Representative when required or at the request of one or more of the coordinating Contractors.
   1. The Owner’s Representative shall contact the Contractors and make all required arrangements (e.g., time, place, etc.).
   2. All Contractors shall place emphasis and importance on equipment purchases so as to not delay approvals, shop drawings, and the coordinated drawings.

3.4 SCHEDULE OF COORDINATED SHOP DRAWINGS

A. The MC and SM shall complete the ductwork shop drawings within 2 weeks after award of contract (or authorization to proceed).

B. Turn-around time for each Contractor shall be 2 weeks maximum.

3.5 "AS BUILT" DRAWINGS

A. At the completion of the project, “As Built” corrections shall be made to each AutoCAD drawing by each of the aforementioned Contractors and returned to the Owner’s Representative for the Owner’s permanent files and records. These “As Builts” do not remove the obligation of “As Builts” and record drawings as outlined under other sections of the specifications unless the Owner’s Representative elects to do so.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following basic materials and methods to complement other Division 23 Sections.
   1. Piping installation instructions common to most piping systems.
   2. Mechanical sleeve seals.
   3. Sleeves.
   4. Escutcheons.
   5. Fire Stopping.
   6. Identifying devices and labels.
   7. Installation requirements common to equipment specification sections.
   8. Touch-up painting.
   9. Removals.
  10. Repairs.

B. Pipe, pipe fittings and joining materials, and methods are specified in Division 23 piping system sections.

1.2 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:
   2. CPVC: Chlorinated polyvinyl chloride plastic.
   3. NP: Nylon plastic.
   4. HDPE: High Density Polyethylene plastic.
   5. PVC: Polyvinyl chloride plastic.

G. Existing: Condition present prior to award of this contract.
1.3 SUBMITTALS

A. Product Data: For all materials specified within this section

B. Fire Rated Penetration Listing Details: Submit Underwriters Laboratory (UL) penetration listing details specific to the penetrations required by the project along with fire stopping material data.

C. Quality Control Submittals: Fire stopping certificates specified in Quality Assurance below.

1.4 QUALITY ASSURANCE

A. Fire Stopping: Fire stopping installer shall be certified by the fire stopping manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Protect piping, flanges, fittings, and piping specialties to prevent pipe end damage. Maintain end caps through shipping, storage, and handling.

B. Store plastic pipes in locations not subject to direct sunlight.

C. Protect all stored materials from moisture and dirt. Elevate above grade and support to prevent sagging and bending. Do not exceed structural capacity of floor if stored inside.

1.6 SEQUENCING AND SCHEDULING

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where identifying devices are to be applied.

B. Install identifying devices before concealment.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Metal, Flexible Connectors:
   a. Engineered Flexible Products.
   b. Flexicraft Industries.
   c. Grinnell Corp.; Grinnell Supply Sales Co.
   d. Mercer Rubber Co.
   e. Metraflex Co.

2. Mechanical Sleeve Seals:
   a. Calpico, Inc.
   b. Metraflex Co.
   c. Proco Products, Inc.
   d. Thunderline/Link-Seal.
3. Fire-Stopping Sealant:
   a. Dow Corning Corp.
   b. 3M Corp.
   c. Hilti Corp.

4. Pipe Escutcheons:
   c. Grinnell.

5. Identifying Devices:
   b. Seton Identification Products.
   c. W.H. Brady Company.

2.2 MECHANICAL SLEEVE SEALS

A. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with stainless steel bolts and pressure plates, which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical isolation.

2.3 SLEEVES

A. General: The following materials are for wall, floor, slab, and roof penetrations.

B. Pipe:
   1. Steel Sheet Metal: 0.0359-inch (0.9-mm) minimum thickness, galvanized, round tube closed with welded longitudinal joint.

C. Ductwork
   1. All sleeves shall be per SMACNA.

2.4 ESCUTCHEONS

A. General: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
   1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
   2. OD: Completely cover opening.
   3. Stamped Steel: One piece, with set screw and chrome-plated finish.

2.5 FIRE STOPPING

A. UL listed material specific to the UL penetration listing detail.

2.6 IDENTIFYING DEVICES AND LABELS

A. Equipment Nameplates: Metal nameplate with operational data engraved or die-stamped; permanently fastened to equipment.
1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.

B. Stick-on Duct Markers: Manufacturer’s standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl complying with ASME A13.1.

C. Access Panel Markers: 1/16-inch- (2-mm-) thick, engraved plastic-laminate markers, with abbreviated terms and numbers corresponding to concealed valve. Provide 1/8-inch (3-mm) center hole for attachment.

D. Plastic Equipment Markers: ASME A13.1, color-coded, laminated plastic. Include lettering identifying name, equipment service, design capacity, pressure drop, entering and leaving conditions, and RPM indicated on the Contract Documents. Size shall be 2-1/2 by 4 inches (65 by 100 mm) for control devices, dampers, and valves; and 4-1/2 by 6 inches (115 by 150 mm) for equipment. Identifying names and/or abbreviations shall match those indicated on the Contract Documents.

PART 3 – EXECUTION

3.1 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to provide maximum possible headroom if mounting heights are not indicated.

B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components unless otherwise indicated.

C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting and without interference(s) to other installations.

3.2 FIRE STOPPING

A. Fire Stopping: At penetrations through fire-rated walls, partitions, barriers, ceilings, roofs, or floors, the fire rated integrity shall be maintained. Provide manufacturer’s standard fire-stopping sealant with accessory materials having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E814 by Underwriters Laboratory, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction.

3.3 LABELING AND IDENTIFYING

A. Install plastic equipment marker on all equipment provided under this contract.

B. Duct Systems: Identify air supply, return, exhaust, intake, and relief ducts with duct markers. Duct markers shall identify service and direction of flow. Locate markers at maximum intervals of 50 feet (15 m) near points where ducts enter and exit the space, and on ducts located behind all access doors.

C. Provide additional mechanical identification materials and devices to supplement field or factory supplied nameplates that have become visually blocked by work of this or other Divisions.

D. Clean faces of identification devices.
3.4 TOUCH-UP PAINTING

A. Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 REMOVALS

A. Disconnect and remove work where indicated on the Contract Documents in its entirety.

B. Removal: Remove indicated equipment, piping, ductwork, insulation, and associated components from Project site and dispose of in a legal manner. Provide Owner’s right of first refusal for all equipment removed.

C. Where work is indicated to be abandoned in place, cut and remove pipe or ductwork a minimum of 2 inches (50 mm) beyond the wall, floor, ceiling, or roof. Patch surface to match existing finish of adjacent construction.

D. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

3.6 REPAIRS

A. If existing or new work is damaged or disturbed, remove damaged sections and install new products of equal capacity and quality.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This section specifies mechanical hangers, support, and anchors and includes the following:
   1. Horizontal-piping hangers and supports.
   2. Vertical-piping clamps.
   3. Hanger-rod attachments.
   4. Building attachments.
   5. Saddles and shields.
   6. Spring hangers and supports.
   7. Miscellaneous materials.
   8. Pipe alignment guides.
  10. Equipment supports.

1.2 SUBMITTALS

A. Product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing Manufacturer’s figure number, size, location, and features for each required pipe hanger and support.

B. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the “Quality Assurance” Article.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Hangers and supports shall comply with NFPA Standard No. 13 when used as a component of a fire protection system.

B. MSS Compliance: Provide hangers, supports, and components conforming to the latest requirements of MSS Standard Practices SP-58 and SP-69.

C. Qualify welding processes and welding operators according to AWS D1.1 “Structural Welding Code-Steel.”
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

D. Qualify welding processes and welding operators according to ASME “Boiler and Pressure Vessel Code,” Section IX, “Welding and Brazing Qualifications.”

E. Listing and Labeling: Provide hangers and supports that are listed and labeled as defined in NFPA 70, Article 100.
   1. UL and FM Compliance: Hangers, supports, and components include listing and labeling by UL and FM where used for fire protection piping systems.
   2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.
PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

A. Hangers and support components shall be factory fabricated of materials, design, and manufacturer complying with MSS SP-58.
   1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
   2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.

2.2 PIPE HANGERS AND SUPPORTS

A. Pipe Insulation Shields: Fabricated of steel, with a minimum of 180 degrees unless otherwise indicated. Shields for use with hangers and supports with the exception of combination clevis type hangers shall be in accordance with the following schedule:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (INCHES)</th>
<th>SHIELD LENGTH (INCHES)</th>
<th>SHIELD GAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 2</td>
<td>12</td>
<td>18</td>
</tr>
</tbody>
</table>

B. Pipe Covering Protection Saddles: 3/16-inch thick steel of sufficient depth for the insulation thickness specified, notched so that saddle contact with the pipe is approximately 50 percent of the total axial cross section. Saddles for pipe 12 inches in size and larger shall have a center support.

C. Pipe Hangers: Height adjustable standard duty clevis type with cross bolt and nut. Pipe spreaders or spacers shall be used on cross bolts of clevis hangers when supporting piping 10 inches iron pipe size (IPS) and larger.

D. Adjustable Floor Rests and Base Flanges: Steel.

E. Hanger Rods: Galvanized, mild low carbon steel, fully threaded with two nuts at each end for positioning rod and hanger and locking each in place.

F. Riser Clamps: Malleable iron or steel.

G. Rollers: Cast Iron.

H. Restraints, Anchors, and Supports for Grooved End Piping System: As recommended by the grooved end fitting manufacturer.

2.3 FASTENERS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly’s Div./USM Corp. Parasleeve Series, Ramset’s Dynabolt Series, or Red Head/Phillips AN1405, HN-1614, FS-1411 Series.

B. Wedge Anchors (Zinc Plated, Group II, Type 4, Class 1): Hilti’s Kwik Bolt Series, Molly’s Div./USM Corp. Parabolt PB Series, Ramset’s Trubolt T Series, or Red Head/Phillips WS-3822.

C. Self-Drilling Anchors (Group III, Type 1): Ramset’s RD Series, or Red Head/Phillips Series S-14.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset’s Dynaset DS Series, Hilti’s HDI Series, or Red Head/Phillips J Series.
E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS-38 Series.

F. Continuous Slotted Type Concrete Insert, Galvanized:
   1. Load Rating:
      a. 800 pounds/feet: Kindorf’s D-986.
      b. 1500 pounds/feet: Kindorf’s D-980.
      c. 3000 pounds/feet: Hohmann & Barnard’s Inc. Type CS-H.
      d. 4500 pounds/feet: Hohmann & Barnard’s Inc. Type CS-HD.

G. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive 3/4-inch diameter machine bolts.

H. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, internally threaded to receive 3/4-inch bolts having special wedge-shaped heads.

I. Bolts, Nuts, Washers, Lags, and Screws: Medium carbon steel, size and type to suit application, galvanized for high humidity locations, and treated wood, plain finish for other interior locations. Except where shown otherwise on the Drawings, furnish type, size, and grade required for proper installation of the Work.

2.4 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A36/A36M, steel plates, shapes, and bars, black, and galvanized.

B. Bolts and Nuts: ASME B18.10 or ASTM A183, steel, hex-head, track bolts, and nuts.

C. Washers: ASTM F844, steel, plain, flat washers.

D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.
   1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, nongaseous and is recommended for both interior and exterior applications.
   2. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength.

E. Pipe Alignment Guides: Factory fabricated, of cast semi-steel or heavy fabricated steel consisting of bolted two-section outer cylinder and base with two-section guiding spider that bolts tightly to pipe.
   1. Length of guides: As recommended by manufacturer to allow indicated travel.

PART 3 – EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69 and SP-89. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.

B. Do not hang or support one pipe from another or from ductwork.
C. Support all insulated horizontal piping conveying refrigerants or other fluids below ambient temperature by means of hangers or supports with insulation shields installed outside of the insulation.

D. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules except as otherwise specified or noted on the Drawings.

<table>
<thead>
<tr>
<th>PIPE MATERIAL</th>
<th>MAXIMUM SPACING (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper tubing, 1-1/4 inches and smaller</td>
<td>6</td>
</tr>
</tbody>
</table>

E. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.

F. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings, or accessories occur to support the concentrated loads.

G. For Branch Piping Runs and Runouts over 5 feet in Length: Install a minimum of one hanger and additional hangers if required by the hanger spacing schedules.

H. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smaller size of pipe being supported. Design the entire hanger assembly based on a safety factor of five for the ultimate strength of the material being used.

I. Size hanger rods in accordance with the following:

<table>
<thead>
<tr>
<th>PIPE OR TUBING SIZE (INCHES)</th>
<th>SINGLE ROD HANGER SIZE (INCHES)</th>
<th>DOUBLE ROD HANGER SIZE (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PIPE</td>
<td>TUBING</td>
</tr>
<tr>
<td>Up to 2</td>
<td>3/8</td>
<td>1/4</td>
</tr>
</tbody>
</table>

J. Secure hanger rods as follows: Install one nut under clevis, angle, or steel member; one nut on top of clevis, angle or steel member; one nut inside insert or on top of upper hanger attachment and one nut and washer against insert or on lower side of upper hanger attachment. A total of four nuts are required for each road, two at upper hanger attachment and two at hanger.

K. Vertical Piping:

1. Support vertical risers of piping systems by means of heavy duty hangers installed close to base of pipe risers and by riser clamps with extension arms at intermediate floors with the distance between clamps not to exceed 25 feet unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction caused by operating temperature ranges.

2. Support extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs to allow room for insulating and vapor sealing around riser clamps.

3. Install intermediate supports between riser clamps on a maximum 6-foot centers for copper tubing risers 1-1/4 inches in size and smaller, installed in finished rooms or spaces other than mechanical equipment machine or steam service rooms or penthouse mechanical equipment rooms.
4. Floor Supports: Install adjustable yoke rests with base flanges for the support of piping unless otherwise indicated on the Drawings. Install supports in a manner, which will not be detrimental to the building structure.

L. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.

M. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

N. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 “Building Services Piping” is not exceeded.

3.2 UPPER HANGER ATTACHMENTS

A. General:
1. In all cases, secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.
2. Do not attach hangers to steel decks which are not to receive concrete fill.
3. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.
4. Do not use flat bars or bent rods as upper hanger attachments.

B. Attachment to Steel Frame Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.
1. Do not use drive-on beam clamps.
2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.
3. Do not drill holes in main structural steel members.
4. “C” clamp type of upper hanger attachments with restraining straps may be used as upper hanger attachments for the support of piping up to a maximum of 3 inches in size and a temperature from 50 DegF to 200 DegF.

3.3 TRAPEZES

A. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.

3.4 COMBINATION CLEVIS HANGER, PIPE INSULATION SHIELD, AND VAPOR BARRIER JACKETED HIGH DENSITY INSULATING SADDLES

A. Install a combination clevis hanger, pipe insulation shield, and vapor barrier jacketed high density insulating saddles at all points of support for piping or tubing to be insulated for cold service. Furnish companion high density vapor barrier jacketed saddle pieces of the same material, thickness, and length for installation over the top 180-degree surface of pipe or tubing at each point of support where an insulated clevis hanger is utilized.
3.5 PIPE INSULATION SHIELDS

A. Install a pipe insulation shield at all points of support for piping insulated with cold service insulation. Center shields on all hangers and supports and install in such a manner so as not to cut, puncture, or press into the insulation or in any manner be detrimental to the vapor barrier.

3.6 PIPE COVERING PROTECTION SADDLES

A. Install pipe covering protection saddles at all points of support for steel piping 6 inches in size and larger, insulated with hot service insulation. Weld saddles to piping to insure movement with pipe.

3.7 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchors by welding steel shapes, plates, and bars to piping and to structure. Comply with ASME B31.9 and with AWS Standards D1.1.

C. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer’s written instructions to control movement to compensators.

D. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.8 INSTALLATION OF PIPE ALIGNMENT GUIDES

A. Install pipe alignment guides on piping that adjoins expansion joints and elsewhere as indicated.

B. Anchor to building substrate.

3.9 EQUIPMENT SUPPORTS

A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.

B. Grouting: Place grout under supports for piping and equipment.

3.10 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for pipe anchors and equipment supports. Install and align fabricated anchors in indicated locations.

B. Touch-Up Painting: Immediately after erection of anchors and supports, clean field welds and abraded areas of shop paint and paint exposed areas with same material as used for shop painting to comply with SSPC-PA-1 requirements for touch-up of field-painted surfaces.
   1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

C. Ferrous Metals: Clean galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structure Painting Council.
   1. Blast steel surfaces clean as recommended by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 10.
2. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
3. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer and touch up with the same primer as the shop coat.

D. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

E. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

F. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so that no roughness shows after finishing and so that contours of welded surfaces match adjacent contours.

3.11 ADJUSTING
   A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

END OF SECTION
SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes testing, adjusting, and balancing HVAC systems to produce design objectives, including the following:
   1. Balancing airflow within distribution systems, including submains, branches, and terminals, to indicated quantities according to specified tolerances.
   2. Adjusting total HVAC systems to provide indicated quantities.
   4. Setting quantitative performance of HVAC equipment.
   5. Verifying that automatic control devices are functioning properly.
   7. Reporting results of the activities and procedures specified in this Section.

1.2 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

D. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

E. Report Forms: Test data sheets for recording test data in logical order.

F. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

G. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

H. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

I. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

J. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

K. Test: A procedure to determine quantitative performance of a system or equipment.
L. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.


P. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.3 SUBMITTALS

A. Quality-Assurance Submittals: Within 30 days from the Contractor's Notice to Proceed, submit 2 copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.

B. Contract Documents Examination Report: Within 45 days from the Contractor's Notice to Proceed, submit 2 copies of the Contract Documents review report as specified in Part 3 of this Section.

C. Strategies and Procedures Plan: Within 60 days from the Contractor's Notice to Proceed, submit 2 copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 "Preparation" Article below. Include a complete set of report forms intended for use on this Project.

D. Certified Testing, Adjusting, and Balancing Reports: Submit 2 copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.

E. Warranty: Submit 2 copies of special warranty specified in the "Warranty" Article below.

1.4 QUALITY ASSURANCE

A. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by either AABC or NEBB.

B. Testing, Adjusting, and Balancing Conference: Meet with the Owner's and the Engineer's representatives on approval of the testing, adjusting, and balancing strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of testing, adjusting, and balancing team members, equipment manufacturers' authorized service representatives, HVAC controls Installer, and other support personnel. Provide 7 days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:
   a. Submittal distribution requirements.
   c. Testing, adjusting, and balancing plan.
   d. Work schedule and Project site access requirements.
   e. Coordination and cooperation of trades and subcontractors.
   f. Coordination of documentation and communication flow.

C. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
1. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.

2. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.


E. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards.

F. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.5 PROJECT CONDITIONS

A. Partial Owner Occupancy: The Owner may occupy completed areas of the building before Substantial Completion. Cooperate with the Owner during testing, adjusting, and balancing operations to minimize conflicts with the Owner's operations.

1.6 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days' advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after the required leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

1.7 WARRANTY

A. General Warranty: The national project performance guarantee specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Guarantee: Provide a guarantee on AABC’s "National Standards" forms stating that AABC will assist in completing the requirements of the Contract Documents or NEBB will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:

   1. The certified Agent has tested and balanced systems according to the Contract Documents.
   2. Systems are balanced to optimum performance capabilities within design and installation limits.

PART 2 – PRODUCTS (NOT APPLICABLE)
PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and to discover conditions in systems’ designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
   1. Verify that balancing devices, such as manual volume dampers, are installed as required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine equipment performance data, including fan curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

D. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

E. Examine system and equipment test reports.

F. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

G. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

H. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

I. Examine terminal units, such as variable-air-volume boxes and mixing boxes, to verify that they are accessible and their controls are connected and functioning.

J. Examine heat-transfer coils for clean and straight fins.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:
   1. Dampers and other controlled devices operate by the intended controller.
   2. Dampers are in the position indicated by the controller.
   3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
   4. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
   5. Sensors are located to sense only the intended conditions.
   6. Sequence of operation for control modes is according to the Contract Documents.
   7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
8. Interlocked systems are operating.
9. Changeover from heating to cooling mode occurs according to design values.

M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

3.2 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:
1. Permanent electrical power wiring is complete.
2. Automatic temperature-control systems are operational.
3. Equipment and duct access doors are securely closed.
4. Balance, smoke, and fire dampers are open.
5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
6. Windows and doors can be closed so design conditions for system operations can be met.

3.3 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, and pipes, for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.4 FUNDAMENTAL AIR SYSTEMS' BALANCING PROCEDURES

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

E. Verify that motor starters are equipped with properly sized thermal protection.

F. Check dampers for proper position to achieve desired airflow path.

G. Check for airflow blockages.

H. Check condensate drains for proper connections and functioning.
I. Check for proper sealing of air-handling unit components.

3.5 VARIABLE-AIR-VOLUME SYSTEMS' ADDITIONAL PROCEDURES

A. Compensating for Diversity: When the total airflow of all terminal units is more than the fan design airflow volume, place a selected number of terminal units at a maximum set-point airflow condition until the total airflow of the terminal units equals the design airflow of the fan. Select the reduced airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:
   1. Set outside-air dampers at minimum, and return- and exhaust-air dampers at a position that simulates full-cooling load.
   2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge duct losses.
   3. Measure total system airflow. Adjust to within 10 percent of design airflow.
   4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use the terminal unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units as described for constant-volume air systems.
   5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow as described for constant-volume air systems.
      a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
   6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outside airflow. Adjust the fan and balance the return-air ducts and inlets as described for constant-volume air systems.
   7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure adequate static pressure is maintained at the most critical unit.
   8. Record the final fan performance data.

3.6 MULTIZONE SYSTEMS' ADDITIONAL PROCEDURES

A. Set unit at full flow through the cooling coil if coil has that capacity.

B. Adjust each zone damper to design airflow.

3.7 CONDENSING UNITS

A. Verify proper rotation of fans and measure entering- and leaving-air temperatures. Record compressor data.

3.8 TEMPERATURE TESTING

A. During testing, adjusting, and balancing, report need for adjustment in temperature regulation within the automatic temperature-control system.
B. Measure and record indoor wet- and dry-bulb temperatures every other hour for a period of 2 successive days, in each separately controlled zone, to prove correctness of final temperature settings. Measure when the building or zone is occupied. Also measure and record outside air, wet- and dry-bulb temperatures concurrently with above.

3.9 TEMPERATURE-CONTROL VERIFICATION
A. Verify that controllers are calibrated and commissioned.
B. Check transmitter and controller locations and note conditions that would adversely affect control functions.
C. Record controller settings and note variances between set points and actual measurements.
D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).
E. Verify free travel and proper operation of control devices such as damper operators.
F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow measurements. Note the speed of response to input changes.
G. Confirm interaction of electrically operated switch transducers.
H. Confirm interaction of interlock and lockout systems.
I. Verify main control supply-air pressure and observe compressor and dryer operations.
J. Record voltages of power supply and controller output. Determine if the system operates on a grounded or non-grounded power supply.
K. Note operation of electric actuators using spring return for proper fail-safe operations.

3.10 TOLERANCES
A. Set HVAC system airflow rates within plus or minus 10 percent.

3.11 REPORTING
A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article above, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.12 FINAL REPORT
A. General: Electronic PDF with tabulated, bookmarked sections by tested and balanced systems.
B. Include a certification sheet signed and sealed by the certified testing and balancing engineer.
1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:
   1. Fan curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
   4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of testing, adjusting, and balancing Agent.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   9. Signature of testing, adjusting, and balancing Agent who certifies the report.
   10. Summary of contents, including the following:
       a. Design versus final performance.
       b. Notable characteristics of systems.
       c. Description of system operation sequence if it varies from the Contract Documents.
   11. Nomenclature sheets for each item of equipment.
   12. Data for terminal units, including manufacturer, type size, and fittings.
   13. Notes to explain why certain final data in the body of reports vary from design values.
   14. Test conditions for fans and pump performance forms, including the following:
       a. Settings for outside-, return-, and exhaust-air dampers.
       b. Conditions of filters.
       c. Cooling coil, wet- and dry-bulb conditions.
       d. Face and bypass damper settings at coils.
       e. Fan drive settings, including settings and percentage of maximum pitch diameter.
       f. Inlet vane settings for variable-air-volume systems.
       g. Settings for supply-air, static-pressure controller.
       h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air-side distribution systems. Present with single-line diagrams and include the following:
   1. Quantities of outside, supply, return, and exhaust airflows.
   2. Duct, outlet, and inlet sizes.
   3. Terminal units.

F. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:
   1. Unit Data: Include the following:
       a. Unit identification.
       b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer’s serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches (mm), and bore.
i. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).
j. Number of belts, make, and size.
k. Number of filters, type, and size.

2. Motor Data: Include the following:
   a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).

3. Test Data: Include design and actual values for the following:
   a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Filter static-pressure differential in inches wg (Pa).
f. Preheat coil static-pressure differential in inches wg (Pa).
g. Cooling coil static-pressure differential in inches wg (Pa).
h. Heating coil static-pressure differential in inches wg (Pa).
i. Outside airflow in cfm (L/s).
j. Return airflow in cfm (L/s).
k. Outside-air damper position.
l. Return-air damper position.

G. Gas-Fired Heat Apparatus Test Reports: In addition to the manufacturer’s factory startup equipment reports, include the following:

1. Unit Data: Include the following:
   a. System identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer’s serial number.
f. Fuel type in input data.
g. Output capacity in Btuh (kW).
h. Ignition type.
i. Burner-control types.
j. Motor horsepower and rpm.
k. Motor volts, phase, and hertz.
l. Motor full-load amperage and service factor.
m. Sheave make, size in inches (mm), and bore.
n. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).

2. Test Data: Include design and actual values for the following:
   a. Total airflow rate in cfm (L/s).
   b. Entering-air temperature in DegF (DegC).
   c. Leaving-air temperature in DegF (DegC).
   d. Air temperature differential in DegF (DegC).
   e. Entering-air static pressure in inches wg (Pa).
   f. Leaving-air static pressure in inches wg (Pa).
   g. Air static-pressure differential in inches wg (Pa).
   h. Low-fire fuel input in Btuh (kW).
   i. High-fire fuel input in Btuh (kW).
   j. Manifold pressure in psig (kPa).
   k. High-temperature-limit setting in DegF (DegC).
   l. Operating set point in Btuh (kW).
   m. Motor voltage at each connection.
   n. Motor amperage for each phase.
   o. Heating value of fuel in Btuh (kW).

H. Electric-Coil Test Reports: For electric furnaces, duct coils, and electric coils installed in central-station air-handling units, include the following:
   1. Unit Data: Include the following:
      a. System identification.
      b. Location.
      c. Coil identification.
      d. Capacity in Btuh (kW).
      e. Number of stages.
      f. Connected volts, phase, and hertz.
      g. Rated amperage.
      h. Airflow rate in cfm (L/s).
      i. Face area in sq. ft. (sq. m).
      j. Minimum face velocity in fpm (m/s).
   2. Test Data: Include design and actual values for the following:
      a. Heat output in Btuh (kW).
      b. Airflow rate in cfm (L/s).
      c. Air velocity in fpm (m/s).
      d. Entering-air temperature in DegF (DegC).
      e. Leaving-air temperature in DegF (DegC).
      f. Voltage at each connection.
      g. Amperage for each phase.

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
   1. Fan Data: Include the following:
      a. System identification.
      b. Location.
      c. Make and type.
      d. Model number and size.
      e. Manufacturer’s serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).

2. Motor Data: Include the following:
a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Sheave dimensions, center-to-center and amount of adjustments in inches (mm).
g. Number of belts, make, and size.

3. Test Data: Include design and actual values for the following:
a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

J. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data: Include the following:
a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in DegF (DegC).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. ((sq. m)).
g. Design airflow rate in cfm (L/s).
h. Design velocity in fpm (m/s).
i. Actual airflow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

K. Air-Terminal-Device Reports: For terminal units, include the following:
1. Unit Data: Include the following:
a. System and air-handling unit identification.
b. Location and zone.
c. Test apparatus used.
d. Area served.
e. Air-terminal-device make.
f. Air-terminal-device number from system diagram.
g. Air-terminal-device type and model number.
h. Air-terminal-device size.
i. Air-terminal-device effective area in sq. ft. ((sq. m)).
2. Test Data: Include design and actual values for the following:
a. Airflow rate in cfm (L/s).
b. Air velocity in fpm (m/s).
c. Preliminary airflow rate as needed in cfm (L/s).
d. Preliminary velocity as needed in fpm (m/s).
e. Final airflow rate in cfm (L/s).
f. Final velocity in fpm (m/s).
g. Space temperature in DegF (DegC).

L. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
   1. Unit Data: Include the following:
      a. System and air-handling unit identification.
      b. Location and zone.
      c. Room or riser served.
      d. Coil make and size.
      e. Flowmeter type.
   2. Test Data: Include design and actual values for the following:
      a. Airflow rate in cfm (L/s).
      b. Entering-air temperature in DegF (DegC).
      c. Leaving-air temperature in DegF (DegC).

M. Instrument Calibration Reports: For instrument calibration, include the following:
   1. Report Data: Include the following:
      a. Instrument type and make.
      b. Serial number.
      c. Application.
      d. Dates of use.
      e. Dates of calibration.

3.13 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
A. This Section includes pipe, duct, and equipment insulation.

1.2 DEFINITIONS
A. Hot Surfaces: Normal operating temperatures of 100 DegF or higher.
B. Dual-Temperature Surfaces: Normal operating temperatures that vary from hot to cold.
C. Cold Surfaces: Normal operating temperatures less than 75 DegF.
D. Thermal Resistivity: “r-values” represent the reciprocal of thermal conductivity (k-value). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees (DegF) between two exposed faces required to cause one Btu to flow through one square foot of material, in one hour, at a given mean temperature.
E. Density: Is expressed in pounds per square foot (lb/sq.ft).

1.3 SUBMITTALS
A. Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.
B. Manufacturer’s installation instructions.
C. Schedule of materials and thickness for each piece of equipment.
D. Samples of each type of insulation and jacket. Identify each sample describing product and intended use. Submit the following sizes of sample materials:
   1. Board and Block Insulation: 12-inch square section.
   2. Pre-Formed Pipe Insulation: 12 inches long, 2-inch NPS.

1.4 QUALITY ASSURANCE
A. Fire Performance Characteristics: Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.
   1. Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.
   2. Exterior Insulation: Flame spread rating of 75 or less and a smoke developed rating of 150 or less.

1.5 SEQUENCING AND SCHEDULING
A. Schedule insulation application after testing of piping and duct systems.
PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Glass Fiber:
      a. CertainTeed Corporation.
      b. Knauf Fiberglass GmbH.
      c. Manville.
      d. Owens-Corning Fiberglas Corporation.
      e. USG Interiors, Inc. - Thermafiber Division.
   2. Flexible Elastomeric Cellular:
      a. Armstrong World Industries, Inc.
      b. Halstead Industrial Products.
      c. IMCOA.
      d. Rubatex Corporation.

2.2 GLASS FIBER

A. Material: Inorganic glass fibers, bonded with a thermosetting resin.


C. Board: ASTM C612, Class 2, semi-rigid jacketed board.
   1. Thermal Conductivity: 0.25 average maximum at 75 DegF mean temperature.
   2. Density: 12 pcf average maximum.

D. Blanket: ASTM C553, Type II, Class F-1, jacketed flexible blankets.
   1. Thermal Conductivity: 0.30 average maximum at 75 DegF mean temperature.

E. Preformed Pipe Insulation: ASTM C547, Class 1, rigid pipe insulation, jacketed.
   1. Thermal Conductivity: 0.27 average maximum at 75 DegF mean temperature.
   2. Density: 10 average maximum.

F. Adhesive: Produced under the UL Classification and follow-up service.
   1. Type: Non-flammable, solvent-based.
   2. Service Temperature Range: Minus 20 to 180 DegF.

G. Vapor Barrier Coating: Waterproof coating recommended by insulation manufacturer for outside service.

2.3 FLEXIBLE ELASTOMERIC CELLULAR

A. Material: Flexible expanded closed-cell structure with smooth skin on both sides.
   1. Tubular Materials: ASTM C534, Type I.
   2. Sheet Materials: ASTM C534, Type II.
B. Thermal Conductivity: 0.27 average maximum at 75 DegF.

C. Coating: Water based latex enamel coating recommended by insulation manufacturer.

2.4 ADHESIVES

A. Flexible Elastomeric Cellular Insulation Adhesive: Solvent-based, contact adhesive recommended by insulation manufacturer.

B. Lagging Adhesive: MIL-A-3316C, non-flammable adhesive in the following Classes and Grades:
   1. Class 1, Grade A for bonding glass cloth and tape to unfaced glass fiber insulation, sealing edges of glass fiber insulation, and bonding lagging cloth to unfaced glass fiber insulation.
   2. Class 2, Grade A for bonding glass fiber insulation to metal surfaces.

2.5 JACKETS

A. General: ASTM C921, Type 1, except as otherwise indicated.

   1. Water Vapor Permeance: 0.02 perm maximum, when tested according to ASTM E96.
   2. Puncture Resistance: 50 beach units minimum, when tested according to ASTM D781.

C. PVC Jacketing: High-impact, ultra-violet-resistant PVC, 20-mils thick, roll stock ready for shop or field cutting and forming to indicated sizes.
   1. Adhesive: As recommended by insulation manufacturer.

D. PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20-mil-thick, high-impact, ultra-violet-resistant PVC.
   1. Adhesive: As recommended by insulation manufacturer.

2.6 ACCESSORIES AND ATTACHMENTS

A. Glass Cloth and Tape: Woven glass fiber fabrics, plain weave, pre-sized a minimum of 8 ounces per square yard.
   1. Tape Width: 4 inches.
   2. Cloth Standard: MIL-C-20079H, Type I.
   3. Tape Standard: MIL-C-20079H, Type II.

B. Bands: 3/4-inch wide, in one of the following materials compatible with jacket:
   1. Stainless Steel: Type 304, 0.020-inch-thick.
   2. Galvanized Steel: 0.005-inch-thick.
   3. Aluminum: 0.007-inch-thick.
   4. Brass: 0.01-inch-thick.
   5. Nickel-Copper Alloy: 0.005-inch-thick.

C. Wire: 14-gage nickel copper alloy, 16-gage, soft-annealed stainless steel, or 16-gage, soft-annealed galvanized steel.

D. Corner Angles: 28-gage, 1-inch by 1-inch aluminum, adhered to 2-inch by 2-inch Kraft paper.
E. Anchor Pins: Capable of supporting 20 pounds each. Provide anchor pins and speed washers of sizes and diameters as recommended by the manufacturer for insulation type and thickness.

2.7 SEALING COMPOUNDS

A. Vapor Barrier Compound: Water-based, fire-resistive composition.
   1. Water Vapor Permeance: 0.08 perm maximum.
   2. Temperature Range: Minus 20 to 180 DegF.

B. Weatherproof Sealant: Flexible-elastomer-based, vapor-barrier sealant designed to seal metal joints.
   1. Water Vapor Permeance: 0.02 perm maximum.
   2. Temperature Range: Minus 50 to 250 DegF.

PART 3 – EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean, dry, and remove foreign materials such as rust, scale, and dirt.

3.2 INSTALLATION, GENERAL

A. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each mechanical system.

B. Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

C. Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 DegF.

D. Install insulation only after systems to be insulated have been tested and approved.

E. Apply insulation material, accessories, and finishes according to the manufacturer’s printed instructions.

F. Install insulation with smooth, straight, and even surfaces.

G. Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier.

H. Seal penetrations for hangers, supports, anchors, and other projections in insulation requiring a vapor barrier.

I. Seal Ends: Except for flexible elastomeric insulation, taper ends at 45 degree angle and seal with lagging adhesive. Cut ends of flexible elastomeric cellular insulation square and seal with adhesive.

J. Apply adhesives and coatings at manufacturer’s recommended coverage-per-gallon rate.

K. Keep insulation materials dry during application and finishing.

L. Install board and block materials with a minimum dimension of 12 inches and a maximum dimension of 48 inches.
M. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:
   1. Metal ducts with duct liner.
   2. Factory-insulated flexible ducts.
   3. Factory-insulated plenums, casings, terminal boxes, and filter boxes and sections.
   4. Flexible connectors for ducts and pipes.
   5. Vibration control devices.
   6. Testing laboratory labels and stamps.
   7. Nameplates and data plates.
   8. Access panels and doors in air distribution systems.
   9. Return air ductwork concealed in spaces which are used as return air plenums need not be insulated, unless otherwise noted.

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. Tightly butt longitudinal seams and end joints. Bond with adhesive.

B. Stagger joints on double layers of insulation.

C. Apply insulation continuously over fittings, valves, and specialties except as otherwise indicated.

D. Apply insulation with a minimum number of joints.

E. Apply insulation with integral jackets as follows:
   1. Pull jacket tight and smooth.
   2. Cover circumferential joints with butt strips, at least 3 inches wide, and of same material as insulation jacket. Secure with adhesive along both edges of butt strip and space 4 inches on center.
   3. Longitudinal Seams: Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap.
   4. Vapor Barrier Coatings: Where vapor barriers are indicated, apply on seams and joints and at ends butt to flanges, unions, valves, and fittings.
   5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating.
   6. Repair damaged insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

F. Roof Penetrations: Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.

G. Interior Walls and Partitions Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions. Apply an aluminum jacket with factory-applied moisture barrier over insulation. Extend 2 inches from both surfaces of wall or partition. Secure aluminum jacket with metal bands at both ends. Seal ends of jacket with vapor barrier coating. Seal around penetration with joint sealer.
H. Fire-Rated Walls and Partitions Penetrations: Terminate insulation at penetrations through fire-rated walls and partitions. Seal insulation ends with vapor barrier coating. Seal around penetration with firestopping or fire-resistant joint sealer.

I. Flanges, Fittings, and Valves - Interior Exposed and Concealed: Coat pipe insulation ends with vapor barrier coating. Apply pre-molded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.
   1. Use same material and thickness as adjacent pipe insulation.
   2. Overlap nesting insulation by 2 inches or 1-pipe diameter, whichever is greater.
   3. Apply materials with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.
   4. Insulate elbows and tees smaller than 3 inches pipe size with pre-molded insulation.
   5. Insulate elbows and tees 3 inches and larger with pre-molded insulation or insulation material segments. Use at least 3 segments for each elbow.
   6. Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.
   7. Cover insulation, except for metal jacketed insulation with 2 layers of lagging adhesive to a minimum thickness of 1/16 inch. Install glass cloth between layers. Overlap adjacent insulation by 2 inches in both directions from joint with glass cloth and lagging adhesive.

J. Hangers and Anchors: Apply insulation continuously through hangers and around anchor attachments. For cold surface piping, extend insulation anchor legs a minimum of 12 inches and taper and seal insulation ends.
   1. Inserts and Shields: Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.
   2. Special Treatment at Hanger Locations: At hanger locations on insulated piping 2 inches and larger, install high density rigid fiber glass pipe support blocks. On piping up to and including 5 inches, install one block at each hanger, directly on the bottom of the pipe. For 6-, 8-, and 10-inch piping, install two (2) blocks at each hanger oriented 30 degrees from each side of the bottom. For piping 12 inches and larger, orientate blocks at both the 30-degree positions and directly on the bottom. Install blocks inside cut out section of pipe insulation, being careful not to damage the vapor barrier jacketing. Any jacketing so damaged should be repaired with matching vapor barrier tape.

3.4 GLASS FIBER PIPE INSULATION INSTALLATION
   A. Bond insulation to pipe with lagging adhesive.
   B. Seal exposed ends with lagging adhesive.
   C. Seal seams and joints with vapor barrier compound.

3.5 FLEXIBLE ELASTOMERIC CELLULAR PIPE INSULATION INSTALLATION
   A. Slip insulation on the pipe before making connections wherever possible. Seal joints with adhesive. Where the slip-on technique is not possible, cut one side longitudinally and apply to the pipe. Seal seams and joints with adhesive.
   B. Valves, Fittings, and Flanges: Cut insulation segments from pipe or sheet insulation. Bond to valve, fitting, and flange and seal joints with adhesive.
      1. Miter cut materials to cover soldered elbows and tees.

3.6 DUCT INSULATION

A. Install block and board insulation as follows:
   1. Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams, and chipped edges with vapor barrier compound.
   2. Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.

B. Blanket Insulation: Install tight and smooth. Secure to ducts having long sides or diameters as follows:
   1. Smaller than 24 Inches: Bonding adhesive applied in 6-inch-wide transverse strips on 12-inch centers.
   2. 24 Inches and Larger: Anchor pins spaced 12 inches apart each way. Apply bonding adhesive to prevent sagging of the insulation.
   3. Overlap joints 3 inches.
   4. Seal joints, breaks, and punctures with vapor barrier compound.
   5. Minimize compression during installation.

3.7 JACKETS

A. Foil and Paper Jackets: Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2-inch laps at longitudinal joints and 3-inch-wide butt strips at end joints.
   1. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.
   2. Provide PVC fitting covers.

3.8 FINISHES

A. Flexible Elastomeric Cellular Insulation: After adhesive has fully cured, apply two (2) coats of protective coating to exposed insulation.

3.9 APPLICATIONS

A. General: Materials and thicknesses are specified in schedules at the end of this Section.

B. Interior Piping Systems: Unless otherwise indicated, insulate the following piping systems:
   1. Refrigerant.
   2. Cooling coil condensate.

C. Exterior Piping Systems: Unless otherwise indicated, insulate the following piping systems:
   1. Refrigerant.

D. Duct Systems: Unless otherwise indicated, insulate the following duct systems:
1. Interior supply, return and outside air ductwork.
2. Interior exposed and concealed supply fans, air handling unit casings and outside air plenums.
3. Interior kitchen hood exhaust ductwork.

3.10 PIPE INSULATION SCHEDULES

A. General: Abbreviations used in the following schedules include:

1. Field-Applied Jackets:
   a. P – PVC.
   c. A – Aluminum.
   d. SS – Stainless Steel.

2. Pipe Sizes:
   a. NPS – Nominal Pipe Size.
   b. Cooling Coil Condensate, All Sizes (Interior): 1/2-inch-thick glass fiber insulation with vapor barrier. Field-applied jacket is not required.

B. Interior Refrigerant:

<table>
<thead>
<tr>
<th>PIPE SIZES (NPS)</th>
<th>MATERIALS</th>
<th>THICKNESS IN INCHES</th>
<th>VAPOR BARRIER REQUIRED</th>
<th>FIELD APPLIED JACKET</th>
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</thead>
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<tr>
<td>1-1/2 or less</td>
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<td>None</td>
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</table>

C. Exterior Refrigerant and Brine:

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<tr>
<th>PIPE SIZES (NPS)</th>
<th>MATERIALS</th>
<th>THICKNESS IN INCHES</th>
<th>VAPOR BARRIER REQUIRED</th>
<th>FIELD APPLIED JACKET</th>
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</thead>
<tbody>
<tr>
<td>1-1/2 or less</td>
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<td>(P) (A) (SS)</td>
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<td></td>
<td>Flexible Elastomeric</td>
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<td>None</td>
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</table>

3.11 DUCT SYSTEMS INSULATION SCHEDULE

A. General: Abbreviations used in the following schedules include:

1. Field-Applied Jackets:
   a. P – PVC.
   c. A – Aluminum.
   d. SS – Stainless Steel.

B. Interior Concealed HVAC Supply, Return and Outside Air Ducts and Plenums:

<table>
<thead>
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<th>MATERIAL</th>
<th>FORM</th>
<th>THICKNESS IN INCHES</th>
<th>VAPOR BARRIER REQUIRED</th>
<th>FIELD APPLIED JACKET</th>
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</thead>
<tbody>
<tr>
<td>Glass Fiber</td>
<td>Blanket</td>
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<td>None</td>
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</table>
C. Interior Exposed HVAC Supply, Return and Outside Air Ducts and Plenums:

<table>
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<th>MATERIAL</th>
<th>FORM</th>
<th>THICKNESS IN INCHES</th>
<th>VAPOR BARRIER REQUIRED</th>
<th>FIELD APPLIED JACKET</th>
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<tr>
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<td>Board – Rect.</td>
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</table>

D. Interior Kitchen Hood Exhaust Ducts:

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<th>MATERIAL</th>
<th>FORM</th>
<th>THICKNESS IN INCHES</th>
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<th>FIELD APPLIED JACKET</th>
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<td>Glass Fiber</td>
<td>Blanket</td>
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END OF SECTION
SECTION 23 09 00
INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes control equipment for heating, ventilating and air conditioning (HVAC) systems and components including control components for terminal heating and cooling units that are not supplied with factory-wired controls.

1.2 SYSTEM DESCRIPTION

A. Provide a microprocessor based direct digital control (DDC) building automation system (BAS) as a complete system suitable for the control of the HVAC and other building-level systems as specified and shown. The system shall include software with all necessary means for global data exchange, scheduling, local and remote control and adjustment; load shedding for demand controls; even management; monitoring; trending; logging; maintenance notification; and alarms.

B. BAS main panels for this project shall be located in Electrical Room 103. Coordinate the final location with the facility owner.

C. The control system shall be complete in all respects with system completeness (turnkey system) for the BAS. System shall be a BACnet DDC system. The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. Control system consists of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, wiring, and accessories connected to controllers to operate mechanical systems according to sequences of operation indicated or specified. Provide all hardware, software and ancillary components, and wiring not specifically indicated or specified, but necessary to make the system function according to the intent of the specification. The control system contractor shall also be responsible for the proper operation of the control system and shall provide all necessary debugging and calibration. Size all control apparatus to properly supply and/or operate and control the apparatus served. Note that the control specifications in the design documents may be generic or have a limited amount interfacing information or job specifics (to varying degrees). Examine not only the plans and specifications for this Specification Section but plans and specifications of other related sections and visit the site to become acquainted with all project conditions including existing conditions. Execution of Contract is evidence that control system contractor has examined all drawings and specifications, and that all conditions of installing the work in this Section are verified. Later claims for labor and materials required due to difficulties encountered, which could have been foreseen had examination been made, will not be recognized. The control system shall fully integrate all distributed digital controls, energy management controls and interfaces to mechanical equipment specified elsewhere in Division 23. The new BACnet DDC system shall have been totally programmed and verified as satisfying the requirements of the Sequence of Operation contained hereinafter. However, it shall be possible to reprogram the panels on site either by the BAS Contractor or the Owner. The new DDC system shall be configured to perform all control, alarming, scheduling and energy management routines either as a distributed processing unit to a central remote monitoring and control system or as a standalone unit. The DDC system shall have capability to
include all physical points be automatically trended and alarmed, gathering reports and logs, programming and downloading databases.

D. Upon completion of project ALL host software, documentation, databases, application programming tools, graphical creation tools, passwords shall become owner’s property

1.3 SUBMITTALS

A. Product Data for each type of product specified. Include manufacturer’s technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.

B. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, method of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.

C. Shop Drawings containing the following information for each control system:
   1. Schematic flow diagram showing fans, pumps, coils, dampers, valves, and control devices.
   2. Each control device labeled with setting or adjustable range of control.
   3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.
   4. Details of control panel faces, including controls, instruments, and labeling.
   5. Written description of sequence of operation.
   6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
   7. Listing of connected data points, including connected control unit and input device.
   8. System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
   9. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
  10. Software description and sequence of operation.

D. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

E. Maintenance data for control systems equipment to be included in the operation and maintenance manual. Include the following:
   1. Maintenance instructions and spare parts lists for each type of control device and compressed-air stations.
   2. Interconnection wiring diagrams with identified and numbered system components and devices.
   4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
   5. Calibration records and list of set points.

F. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.
1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer specializing in control system installations.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing control systems similar to those indicated for this Project and that have a record of successful in-service performance.

C. Startup Personnel Qualifications: Engage specially trained personnel in direct employ of manufacturer of primary temperature control system.

D. Comply with NFPA 90A.

E. Comply with NFPA 70.

F. Coordinate equipment selection with Division 26 Section to achieve compatibility with equipment that interfaces with that system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store equipment and materials inside and protected from weather.

B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

   1. DDC Systems and Components:
      a. Alerton Technologies, Inc.
      b. Automated Logic Corporation.
      c. Johnson Controls, Inc.; Factory Branch only.
      d. Trane Co. (The); Commercial Systems Group.
      e. Siemens Building Technologies.
      f. ALC.
      g. Andover Controls.

2.2 DIRECT DIGITAL CONTROL (DDC) EQUIPMENT

A. Application Software: Include the following:

   1. Input/output capability from operator station.
   2. Operator system access levels via software password.
   3. Database creation and support.
   4. Dynamic color graphic displays.
   5. Alarm processing.
   7. Automatic restart of field equipment on restoration of power.
   8. Data collection.
9. Graphic development on workstation.
10. Maintenance management.

B. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and back-up power source.
   1. Units monitor or control each input/output point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator station.
   2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
      a. Global communications.
      b. Discrete/digital, analog, and pulse input/output.
      c. Monitoring, controlling, or addressing data points.
      d. Testing and developing control algorithms without disrupting field hardware and controlled environment.

C. Local Area Networks (LANs): Not less than 60 stations or nodes at minimum 19.2 kB.
   1. System Support: Capacity for a minimum of 10 workstations connected to multiuser, multitasking environment with concurrent capability to access DDC network or control units.

D. Software: Update to latest version of software at project completion. Include and implement the following capabilities from the control units:
   1. Units of Measure: Inch-pound and SI metric.
   2. Load Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, DDC with fine tuning, and trend logging.
   3. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.
   4. Chiller Control Programs: Control function of condenser-water reset, chilled-water reset, and equipment sequencing.
   5. Programming Application Features: Include trend point, alarm messages, weekly scheduling, and interlocking.

2.3 COMMUNICATION

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2004, BACnet. LON is not an acceptable protocol.

B. The BAS shall consist of a two-tiered system of an upper level Ethernet TCP/IP Network, and a twisted-pair field bus of Standalone Digital Control Units (SDCUs). All field bus communications must be routed through Ethernet based network controllers or routers, and not directly through PC workstations or servers.

C. The owner shall provide a minimum of one Ethernet network drop and internet access with static IP address to allow communication with the BAS System for remote configuration, diagnostics, and service by the BAS supplier.

D. Level 1 Controllers, the main backbone of the system, shall be an Ethernet 10/100bT LAN/WAN. Network Router/Controllers, Operator Workstations, and the Central File Server shall connect directly to this network without the need for Gateway devices.
E. Where required, provide a BACnet gateway to interface to non-BACnet systems that use the Modbus RTU protocol or other proprietary protocol. The gateway shall communicate directly over Ethernet TCP/IP and shall use the BACnet/IP protocol to communicate with the operator’s workstation.

F. Level 2 Controllers of the system shall consist of one MS/TP field buses managed by the Network Router/Controllers. Minimum speed shall be 76.8 kbps. The Level 2 field bus consists of an RS485, token passing bus that supports up to 127 SDCUs.

2.4 CONTROL PANELS

A. Control Panels: Unitized cabinet with suitable brackets for wall or floor mounting, located adjacent to each system under automatic control. Provide common keying for all panels.

1. Fabricate panels of 0.06-inch (1.5-mm) thick, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock, with manufacturer’s standard shop-painted finish and color.


3. Door-Mounted Equipment: Flush-mount (on hinged door) manual switches, including damper-positioning switches, changeover switches, thermometers, and gages.

4. Graphics: Color-coded graphic, laminated-plastic displays on doors, schematically showing system being controlled, with protective, clear plastic sheet bonded to entire door.

B. Standalone Digital Control Units (SDCUs):

1. SDCUs shall provide control of HVAC including air handling units, rooftop units, variable air volume boxes, and other mechanical equipment. Each controller shall be fully programmable, contain its own control programs and will continue to operate in the event of a failure or communication loss to its associated network controller.

2. Both the operating system of the controller, plus the application program for the controller, shall be stored in non-volatile, FLASH memory. Controllers shall contain enough memory for the current application, plus required history logging, plus a minimum of 20 percent additional free memory.

3. SDCUs shall have a RS-485 communication port to the MS/TP field bus, operating at a speed of at least 76.8 kbps.

a. Input/Output:
   1) Each SDCU shall have enough inputs and outputs to meet the application’s required points. Each SDCU shall support universal inputs, whereas any input may be software-defined as:
      a) Digital Inputs for status/alarm contacts.
      b) Counter Inputs for summing pulses from meters.
      c) Thermistor Inputs for measuring temperatures in space, ducts and thermowells.
      d) Analog inputs for pressure, humidity, flow and position measurements.

b. SDCUs must support both digital and analog output types:
   1) Digital Outputs for on/off equipment control.
   2) Analog Outputs for valve and damper position control, and capacity control of primary equipment.

4. Expandability:
   a. For larger controllers (16-base inputs and up), provide input and output expansion through the use of plug-in modules. At least two I/O modules must be capable of being added to the base SDCU.
5. Hardware Override Switches:
   a. All digital outputs on air handling unit controllers shall include three position manual
      override switches to allow selection of the ON, OFF, or AUTO output state. These
      switches shall be built into the unit and shall provide feedback to the controller so that the
      position of the override switch can be obtained through software. In addition each analog
      output on air handling unit controllers shall be equipped with an override potentiometer
      to allow manual adjustment of the analog output signal over its full range, when the 3
      position manual override switch is placed in the ON position.

6. Room Sensor Support: The SDCU shall support the following two types of room sensors:
   a. Type A: Room thermistor in a stainless steel cover plate with vandal proof screws
   b. Type B: Room thermistor with plastic cover plate and LCD display of space
      temperature.

2.5 ANALOG CONTROLLERS
   A. Step Controllers: 6-stage or 10-stage type, with heavy-duty switching rated to handle loads, UL
      listed and operated by electric motor.
   B. Electric Outdoor Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action
      with adjustable throttling range, adjustable set point, scale range -10 to 70 DegF (-12 to 21 DegC),
      and single- or, double-pole contacts.
   C. Electronic Controllers: Wheatstone bridge-amplifier type, in steel enclosure with provision for
      remote-resistance readjustment. Identify adjustments on controllers, including proportional band and
      authority.
      1. Single controllers can be integral with control motor if provided with accessible control
         readjustment potentiometer.

2.6 TIME CLOCKS
   A. Seven-day, programming-switch timer with synchronous-timing motor and 7-day dial; continuously
      charged, nickel-cadmium-battery-driven, 8-hour, power-failure carryover; multiple-switch tripers;
      minimum of 2 and maximum of 8 signals per day with 2 normally open and 2 normally closed output
      contacts.
   B. Solid-state, programmable time control with 4 separate programs; 24-hour battery carryover;
      individual ON-OFF-AUTO switches for each program; 365-day calendar with 20 programmable
      holidays; choice of fail-safe operation for each program; and system fault alarm.

2.7 SENSORS
   A. Electronic Sensors: Vibration and corrosion resistant, for wall, immersion, or duct mounting as
      required.
         a. Accuracy: Plus or minus 0.2 percent at calibration point.
         b. Wire: Twisted, shielded-pair cable.
         c. Insertion Elements in Ducts: Use where not affected by temperature stratification or
            where ducts are smaller than 9 square feet (1 sq. m).
         d. Averaging Elements in Ducts: Use where ducts are larger than 9 square feet (1 sq. m) or
            where prone to stratification, length as required.
         e. Insertion Elements for Liquids: Brass socket with minimum insertion length of
            2-1/2 inches (64 mm).
1. **Room Sensors:** Match room thermostats, locking cover.

   - **Outside Air Sensors:** Watertight inlet fitting, shielded from direct sunlight.

   - **Room Security Sensors:** Stainless-steel cover plate with insulated back and security screws.

2. **Humidity Sensors:** Bulk polymer sensor element.
   - **Accuracy:** 5 percent full range with linear output.
   - **Duct and Outside Air Sensors:** With element guard and mounting plate, range of 0 to 100 percent relative humidity.

3. **Static-Pressure Transmitter:** Non-directional sensor with suitable range for expected input, temperature compensated.
   - **Accuracy:** 2 percent of full scale with repeatability of 0.5 percent.
   - **Output:** 4 to 20 mA.
   - **Building Static-Pressure Range:** 0 to 0.25 inch w.g. (0 to 62 Pa).
   - **Duct Static-Pressure Range:** 0 to 5 inches w.g. (0 to 1243 Pa).

4. **Pressure Transmitters:** Direct acting for gas, liquid, or steam service, range suitable for system, proportional output 4 to 20 mA.

5. **Carbon Monoxide Detector:** UL listed carbon monoxide detector suitable over temperature range of 40 to 100 DegF, powered with 120 VAC/1 Phase/60 Hertz, and calibrated to alarm at 35 ppm. The detector shall have audible locale alarm horn and shall be remotely monitored by the BAS system.

B. **Equipment Operation Sensors:** As follows:

   - **Status Inputs for Fans:** Differential-pressure switch with adjustable range of 0 to 5 inches w.g. (0 to 1243 Pa).
   - **Status Inputs for Electric Motors:** Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. **Valve/Damper Position Indication:** Potentiometer mounted in enclosure with adjustable crank-arm assembly connected to damper to transmit 0 to 100 percent valve/damper travel.

2.8 **THERMOSTATS**

A. **Low-Voltage, ON-OFF Thermostats:** NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater.

B. **Remote-Bulb Thermostats:** ON-OFF or modulating type, liquid-filled to compensate for changes in ambient temperature, with copper capillary and bulb, unless otherwise indicated.

   - **Bulbs in water lines with separate wells of same material as bulb.**
   - **Bulbs in air ducts with flanges and shields.**
   - **Averaging Elements:** Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit, adequately supported.
   - **Scale settings and differential settings are clearly visible and adjustable from front of instrument.**
   - **ON-OFF, remote-bulb thermostats with precision snap switches, with electrical ratings required by application.**
   - **Construct modulating, remote-bulb, potentiometer thermostats so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.**

C. **Room Thermostat Construction:** Manufacturer’s standard locking covers.
1. Thermometer: Red-reading glass or spiral bimetal.
2. Guards: Heavy-duty, clear plastic or metal-wire, tamperproof guards.
3. Locking Covers: With only temperature indication visible.
4. Limits: Provide on heating/cooling dual-temperature thermostats, to prevent setting cooling set point below 75 DegF (24 DegC), and heating set point above 75 DegF (24 DegC).

D. Room Thermostat Accessories: As follows:
1. Insulating Bases: For thermostats located on exterior walls.
2. Thermostat Guards: Locking transparent-plastic mounted on separate base.
3. Adjusting Key: As required for device.

E. Immersion Thermostat: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range and adjustable set point.

F. Airstream Thermostats: 2-pipe, fully proportional, single temperature, with adjustable set point in middle of range and adjustable throttling range, plug-in test fitting or permanent pressure gage, remote bulb, bimetal rod and tube, or averaging element.

2.9 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or 2-position action.
   1. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.

2.10 DAMPERS

A. Dampers: AMCA-rated, parallel or opposed blade design; form frames from not less than 0.1084-inch (2.8-mm) galvanized steel with mounting holes for duct mounting; damper blades not less than 0.0635-inch (1.6-mm) galvanized steel, with maximum blade width of 8 inches (203 mm).
   1. Blades secured to 1/2-inch (13-mm) diameter, zinc-plated axles using zinc-plated hardware, with nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass. Ends sealed against spring-stainless-steel blade bearings. Thrust bearings at each end of every blade.
   2. Operating Temperature Range: From -40 to 200 DegF (-40 to 93 DegC).
   3. For standard applications as indicated, (as selected by manufacturer’s sizing techniques) with optional closed-cell neoprene edging.
   4. For low-leakage applications as indicated, provide parallel or opposed blade design (as selected by manufacturer’s sizing techniques) with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm per square foot (51 L/s/sq. m) of damper area, at differential pressure of 4 inches w.g. (995 Pa) when damper is being held by torque of 50-inch pounds (5.6 N x m); test in accordance with AMCA 500.

2.11 CONTROL CABLE

A. Electronic Cable for Control Wiring: Provide all control wiring for the complete DEC Control System. Refer to Division 26 Sections for control wiring materials.
2.12 OPERATOR INTERFACE

A. Operator Interface. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information. In addition to the primary operator interface, the system shall include a secondary interface compatible with a locally available commercial wireless network and viewable on a commercially available wireless device such as a Wireless Access Protocol (WAP) enabled cellular telephone or personal digital assistant (PDA). This secondary interface may be text-based and shall provide a summary of the most important data. As a minimum, the following capabilities shall be provided through this interface:

1. An operator authentication system that requires an operator to log in before viewing or editing any data, and which can be configured to limit the privileges of an individual operator.
2. The ability to view and acknowledge any alarm in the system. Alarms or links to alarms shall be provided on a contiguous list so the operator can quickly view all alarms.
3. A summary page or pages for each piece of equipment in the system. This page shall include the current values of all critical I/O points and shall allow the operator to lock binary points on or off and to lock analog points to any value within their range.
4. Navigation links that allow the operator to quickly navigate from the home screen to any piece of equipment in the system, and then return to the home screen. These links may be arranged in a hierarchical fashion, such as navigating from the home screen to a particular building, then to a specific floor in the building, and then to a specific room or piece of equipment.

B. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135-2004, BACnet Annex J.

C. Workstation. Provide workstations and servers to meet or exceed DDC system manufacturer's recommended specifications. The provided system shall have sufficient memory to store system software, one year of data for trended points as required at system acceptance. Configure workstation and network connections to meet specified memory and performance. Serial, parallel, and network communication ports and cables required for proper system operation.

D. The operators workstation shall consist of the following:

1. Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times. Hard disk shall have sufficient memory to store system software, one year of data for trended points, and a system database at least twice the size of the existing database at system acceptance. Configure computers and network connections if multiple computers are required to meet specified memory and performance. Workstations shall be IBM-compatible PCs with a minimum of: the following:
   a. Intel Core i5-i7 processor.
   b. 8 GB RAM.
   c. 1 TB solid state hard drive.
   d. 2x USB 3.1, 1x USB 2.0, 1x HDMI, 1x RJ-45, 1x Headphone/microphone combination jack, DVDRW drive.
   e. Wireless and Bluetooth capabilities.

E. Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

1. Log In and Log Out. System shall require user name and password to log in to operator interface.
2. Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

3. View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.

4. View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.

5. View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.

6. View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.

7. View and Configure Reports. Operators shall be able to run preconfigured reports, to view report results, and to customize report configuration to show data of interest.

8. Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.

9. Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

F. System Software:

1. Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Vista, Microsoft Windows XP Pro, Red Hat Linux, or Sun Solaris.

2. System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.
   a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
   b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
   c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
   d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).
G. System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

2. Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

3. System Configuration. Operators shall be able to configure the system.

4. Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.

5. Security. System shall require a user name and password to view, edit, add, or delete data.
   a. Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.
   b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.

6. System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Section Sequence of Operations for HVAC Controls or shown on the drawings. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.

8. Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

9. Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.

10. Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

11. Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Section Sequence of Operations for HVAC Controls. Trends shall be BACnet trend objects.

12. Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.
13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

14. Standard Reports. Furnish the following standard system reports:
   a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.
   c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:
      1) Alarm History.
      2) Trend Data. Operator shall be able to select trends to be logged.
      3) Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

15. Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and binary values, dynamic text, static text, and animation files to a background graphic using a mouse.

16. Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

17. Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:
   a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.
   b. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.
   c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
   d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step’s time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
   e. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
   f. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
g. Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.
   1) Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.
   2) System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

H. Portable Operator's Terminal. Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

I. BACnet. Web server or workstation shall have demonstrated interoperability during at least one BMA Interoperability Workshop and shall substantially conform to BACnet Operator Workstation (B-OWS) device profile as specified in ASHRAE/ANSI 135-2004, BACnet Annex J.

PART 3 – EXECUTION

3.1 EXAMINATION

   A. Verify that conditioned power supply is available to control units and operator workstation. Verify that field end devices, wiring, and pneumatic tubing are installed before proceeding with installation.

3.2 INSTALLATION

   A. Install equipment as indicated to comply with manufacturer’s written instructions.
   B. Install software in control units and operator workstation. Implement all features of programs to specified requirements and appropriate to sequence of operation.
   C. Connect and configure equipment and software to achieve the sequence of operation specified.
   D. Verify location of thermostats, humidity sensors, and other exposed control sensors with plans and room details before installation. Locate 48 inches (1524 mm) above floor.
      1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
   E. Provide temperature sensors of type and location as indicated below:
      1. Type A Sensor (Stainless Steel Cover Plate):
         a. Entrances.
         b. Public areas.
         c. Storage Rooms
         d. Classrooms
      2. Type B Sensor (Plastic Cover Plate with LCD Temperature Display):
         a. Offices
         b. Conference Rooms
F. Each temperature sensors shall be field calibrated to within 1 DegF of the control system set-point after installation.

G. Install damper motors on outside of duct in warm areas, not where exposed to outdoor temperatures.

H. Install labels and nameplates to identify control components according to Division 23 Sections specifying mechanical identification.

I. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

3.3 ELECTRICAL WIRING AND CONNECTIONS

A. Install raceways, boxes, and cabinets according to Division 26 sections

B. Install building wire and cable according to Division 26 sections

C. Install signal and communication cable according to Division 26 Sections:
   1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
   2. Install exposed cable in raceway.
   3. Install concealed cable in raceway.
   4. Bundle and harness multi-conductor instrument cable in place of single cables where a number of cables follow a common path.
   5. Fasten flexible conductors, bridging cabinets and doors, neatly along hinge side; protect against abrasion. Tie and support conductors neatly.
   6. Number-code or color-code conductors, except local individual room controls, for future identification and servicing of control system.

D. Connect electrical components to wiring systems and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer’s published torque-tightening values for equipment connectors. Where manufacturer’s torquing requirements are not indicated, tighten connectors and terminals according to tightening requirements specified in UL 486A.

E. Connect manual reset limit controls independent of manual control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

F. Connect HAND-OFF-AUTO selector switches to override automatic interlock controls when switch is in HAND position.

3.4 COMMISSIONING

A. Manufacturer’s Field Services: Provide the services of a factory-authorized service representative to start control systems.

B. Test and adjust controls and safeties.

C. Replace damaged or malfunctioning controls and equipment.

D. Start, test, and adjust control systems.

E. Demonstrate compliance with requirements.
F. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.5 DEMONSTRATION

A. Manufacturer’s Field Services: Provide the services of a factory-authorized service representative to demonstrate and train Owner’s maintenance personnel as specified below.

1. Train Owner’s maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

2. Schedule training with Owner with at least 7 days’ notice.

3. Provide the following operator training at a minimum:
   a. Four – 8-hour sessions totaling 32 hours in building automation training. Training shall be broken up into the following sessions:
      1) Two – 8-hour sessions at system start.
      2) One – 8-hour sessions during the warranty period – exact time and date to be determined by the Owner.
      3) One – 8-hour session at the end of the warranty period.
   b. Training shall include a complete review of:
      1) Data displayed.
      2) Alarm and status descriptors.
      3) Requesting data.
      4) Execution of commands.
      5) Request of logs and development of trends.
      6) Trouble shooting technics.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Sequence of operation is hereby defined as the manner and method by which controls function. Requirements for each type of control system operation are specified in this section.

B. Operating equipment, devices, and system components required for control systems are specified in other sections.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings for each system automatically controlled, containing the following information:
   1. Schematic flow diagram of system showing fans, coils, dampers, valves, and control devices.
   2. Label each control device with setting or adjustable range of control.
   3. Indicate pneumatic piping; factory and field wiring.
   4. Indicate each control panel required, with internal and external piping and wiring clearly indicated. Provide detail of panel face, including controls, instruments, and labeling. Include verbal description of sequence of operation.

B. Maintenance Data: Include copy of shop drawings in each maintenance manual.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 VARIABLE AIR VOLUME AIR HANDLING UNITS WITH ECONOMIZER (RTU-1, 2, 3).

A. General The air handling unit shall consist of a supply fan, filter, and mixing box. RTU-2 shall be provided with power exhaust accessory for field installation.

B. The contractor shall coordinate all BMS integration requirements between equipment vendor and controls contractor prior to purchasing equipment. Provide all equipment with communication/interface cards as required for a complete system integration.

C. Sequences:
   1. General: The air handling unit fan and return fan motors shall be energized and de-energized via variable frequency drives provided by the Building Automation System (BAS).
   2. Shut Down/Start Up:
      a. Shut down: The air handling unit fans shall be de-energized, the outdoor air damper shall close and return air damper shall open (via spring return actuator(s)), and the exhaust air damper shall close (via spring return actuator) under the following conditions:
         1) The air handling unit is turned off through the BAS.
         2) The air handling unit is turned off by the fire alarm panel. The fan drives shall de-energize independently of the BAS and the position of the supply fan controls.
3) The air handling unit is turned off using the selector switch on the VFD fan controls.

4) Low Temperature Limit Shut down: If a low temperature limit up stream of the cooling coil senses a temperature below 37 DegF, the air handling unit fans shall be de-energized independent of the selector switch position, the outdoor air damper shall close and return air damper shall open (via spring return actuator(s)), the exhaust air damper shall close (via spring return actuator), and the heating coil energized. Provide one restart through BAS software. Manual reset shall be required on subsequent low temperature alarm condition. The low temperature limit shall be serpentined on the outlet side of the DX coil.

b. Start up: The air handling unit fans and dampers shall be energized when all the following conditions are met:
   1) The air handling unit is turned on during the occupied mode through the BAS.
   2) Low temperature limit(s) are above 37 DegF.
   3) The supply fan variable frequency drive starter is in the "Run" or "Auto" position.

c. Temperature Control:
   1) Temperature Sensing: Temperature sensors shall be installed in the supply, return, outdoor and mixed air streams.
   2) Space temperature sensors shall be provided to control the unit speed and discharge temperature as indicated below.
   3) Temperature Setpoint: The air handling unit heating and cooling controls shall modulate to maintain a discharge air temperature of 55 DegF when the average space temperature is above 70 DegF. When the average space temperature is below 70 DegF, the discharge air temperature shall be reset to 80 DegF (adjustable). The air handling unit speed shall be modulated to maintain space temperature. The air handler shall increase speed to delivery more 55-degree or 80-degree air to the space and then shall modulate back to the minimum air volume that will maintain space temperature. Once the air handler has reached minimum air flow, the 55-degree discharge shall ramp up and the 80 degree discharge ramp down to prevent over cooling or overheating.

d. Occupied Mode:
   1) Heating mode shall be allowed only when the outdoor air temperature falls below 50 DegF. The air handling unit shall switch to heating mode and energize the heating coil to maintain the supply air temperature setpoint.
   2) Cooling mode shall be allowed only when the outdoor air temperature is above 55 DegF. The air handling unit shall switch to cooling mode and maintain the discharge air temperature etpoint by staging and cycling the compressors.
   3) Economizer Mode: When the outdoor air enthalpy is less than the return air enthalpy the economizer mode shall be permitted to operate. The outdoor air, return air, and exhaust air dampers shall be modulated to provide the supply air temperature setpoint. If additional cooling is required to achieve the desired supply air temperature setpoint the cooling mode will also be permitted to operate. The air dampers shall be at the minimum ventilation position if the enthalpy of the outdoor air exceeds the enthalpy of the return air.
   4) Minimum ventilation air volumes shall be set based on the air flows indicated on the drawings and equipment schedules.
   5) Fans: The fan(s) shall operate continuously during occupied hours to provide ventilation.
   6) Building pressurization: Differential pressure control shall be maintained for AHU through the power exhaust component associated with RTU-2.

e. Unoccupied Mode:
1) Night cycle shall apply the heating cycle only. Space temperature shall be maintained by the air handling unit. The unit shall operate at 100 percent return air with the outdoor air damper 100 percent closed. The air handler shall be cycled on and off as required. When all spaces exceed the heating setback setpoint plus the heating setback deadband the fan shall be de-energized. If any space does not reach heating setpoint with the associated VAV box reheat coil energized, then the air handler’s heating coil shall energize until that space is satisfied.

2) Night Purge program shall apply to cooling cycle only. Night Purge shall introduce 100 percent outdoor air any time and the outdoor air is above 50 DegF, the space temperature is above 75 DegF, and the outdoor air dewpoint is less than 60 DegF. Purging shall stop when outdoor air is below 50 DegF, or space temperature is below 75 DegF, or outdoor temperature is less than 5 degrees cooler than space temperature, or outdoor air dewpoint, is greater than 60 degrees.

f. Fan Speed Control:
   1) Speed Setpoint:
   2) The air handling unit supply fan speed shall modulate to maintain space temperature as indicated in the temperature control sequence.
   3) The power exhaust fan shall modulate to maintain building pressurization.
   4) Alarms to be generated at low speed and at high speed as sensed by the fan motor current sensor.

g. Optimum Start/Stop:
   1) Optimum Start: Delay equipment startup based on outdoor air temperature, space temperature, and system response to assure that comfort conditions can be reached exactly at the scheduled occupancy time and operates in both the heating and the cooling cycles. An adaptive algorithm shall be employed which automatically adjusts according to the previous day’s program performance and shall automatically assign longer lead times for weekend and holiday shutdowns. During warm-up and cool-down mode of operation exhaust fans shall be off, unless otherwise indicated, outside air dampers shall be closed and air handling unit shall operate on 100 percent recirculation. Provide lockout of cool-down mode if chillers are disabled.
   2) Optimum Stop: Optimum stop program shall be provided for utilizing stored energy (flywheel effect) to automatically accelerate the stop time as much as one hour based on the external load conditions and the rate of change of the occupied space with the energy source off.

h. Accessories:
   1) Air handling unit filter differential pressure switches shall alarm when a preset limit is exceeded (0.60-inch w.g.).

3.2 ELECTRIC UNIT HEATERS

A. General: Unit heaters are intended to operate standalone.

B. Heater Control: Provide unit-mounted thermostat, set to maintain 60 deg. F. return air compartment, to cycle fan motor to maintain constant space temperature.

3.3 EXHAUST FANS

A. General: The BAS supplier shall provide all necessary appurtenances such as dampers actuators, sensors, relays, and control and communication wiring for a complete installation.

B. Sequences:
1. General: The fan motors shall be energized and de-energized via the Building Automation System.

2. Shut down: The fans shall be de-energized and the associated backdraft dampers closed under the following conditions:
   a. The fans are turned off through the BAS.
   b. For the fans shall be turned off by the fire alarm panel. The fan drives shall de-energize independently of the BAS and the position of the supply fan controls.
   c. The fans are turned off using the selector switch on the start H-O-A switch.

3. Start up: The fans shall be energized and the motorized dampers opened when all the following conditions are met:
   a. The fans are turned on during the occupied mode through the BAS.
   b. The starter is in the "Hand" or "Auto" position.
   c. The kitchen hood control panel is set to "ON" for EF-3.

4. Restroom Exhaust Control (EF-1 & 2):
   a. Occupied Mode:
      1) Fan shall run continuously based on BAS preset schedule of occupancy.
   b. Unoccupied Mode:
      1) Fan shall be off based on BAS preset schedule of occupancy.

5. Kitchen Hood Exhaust Control (EF-3):
   a. Exhaust fan shall energize/de-energize via the dedicated kitchen hood control panel.
      1) Interlock with the associated exhaust hood in their associated room. The BAS shall provide a relay in the power wiring of each hood which shall close contacts upon operation of hood via local fan switch and shall energize the associated exhaust fan. The operation of the exhaust fans shall be independent of the operation of the hood lights.

3.4 VARIABLE AIR VOLUME BOXES WITH ELECTRIC REHEAT

A. General:
   1. The VAV boxes shall be shut off type with SCR electric reheat, primary air valve with floating point electric motor actuator.
   2. The BAS supplier shall provide all necessary appurtenances such as actuators, sensors, relays, and control and communication wiring for a complete installation. Control transformers shall be furnished with VAV boxes.

3. Sequences:
   a. Temperature Control:
      1) Sensors: Temperature sensors shall be supplied mounted and wired as shown on the drawings for each respective VAV box.
      2) Temperature Setpoints: Each VAV box shall be assigned an occupied temperature setpoint and throttling range, and an unoccupied setpoint and throttling range.
   b. Occupied Mode:
      1) Heating Mode: Should the space temperature drop below setpoint (68 DegF, adjustable) a heating demand signal shall be generated to energize the reheat coil to maintain setpoint. The primary air valve shall be in the minimum position.
         a) For parallel fan powered terminal units, the plenum fan shall energize and provide constant heating airflow to the space as indicated.
      2) Cooling Mode: Should the space temperature rise above setpoint (78 DegF, adjustable), the reheat coil shall be de-energized to maintain setpoint. If additional
cooling is required, the primary air valve shall be modulated open until setpoint is achieved.

a) For parallel fan powered terminal units (PIU), the plenum fan shall be de-energized

C. Unoccupied Mode:
1) The VAV box shall operate only as required to satisfy the sequences below.
2) Night Cycle Mode shall apply to heating cycle only. The reheat coil shall be energized to maintain a 60 DegF setpoint. If the space temperature drops to 58 DegF, the air handling unit shall be energized and the reheat coil shall be energized until the space temperature reaches 60 DegF; then the reheat coil shall be de-energized and the air handling unit shall shut down. Where, applicable, the parallel terminal unit plenum fan shall be prioritized to enable and operate until the space reaches adjustable setpoint.
3) Night Purge Model shall only apply to cooling: modulate open unit setpoint is achieved and then modulated to maintain setpoint.

3.5 IDF ROOM AIR-CONDITIONING SYSTEM (AC-1/ACCU-1)

A. General:
1. The BAS supplier shall provide all necessary appurtenances such as sensors, relays, and control and communication wiring for a complete installation.
2. Sequences:
   a. Temperature Control:
      1) Unit shall maintain the IDF room space temperature of 72 deg. F (adjustable) at all times. Alarm shall be sent to the BAS system whenever the IDF room temperature is +/- 2 deg. F outside the setpoint temperature. The BAS supplier shall also provide means for shutting down unit during high level condensate alarm situation.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes refrigerant piping used for air conditioning applications. This Section includes:
   1. Pipes, tubing, fittings, and specialties.
   2. Special duty valves.
   3. Refrigerants.

B. Products installed but not furnished under this Section include pre-charged tubing, refrigerant specialties, and refrigerant accessories furnished as an integral part of or separately with packaged air conditioning equipment.

1.2 SUBMITTALS

A. Product data for the following products:
   1. Each type valve specified.
   2. Each type refrigerant piping specialty specified.

B. Shop Drawings showing layout of refrigerant piping, specialties, and fittings including, but not necessarily limited to, pipe and tube sizes, valve arrangements and locations, slopes of horizontal runs, wall and floor penetrations, and equipment connection details. Show interface and spatial relationship between piping and proximate to equipment.

C. Brazer’s Certificates signed by Contractor certifying that brazers comply with requirements specified under "Quality Assurance" below.

D. Maintenance data for refrigerant valves and piping specialties, for inclusion in Operating and Maintenance Manual.

1.3 QUALITY ASSURANCE

A. Qualify brazing processes and brazing operators in accordance with ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."

B. Regulatory Requirements: Comply with provisions of the following codes:
   1. ANSI B31.5: ASME Code for Pressure Piping - Refrigerant Piping.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Refrigerant Valves and Specialties:
      a. Alco Controls Div, Emerson Electric.
      b. Danfoss Electronics, Inc.
c. EATON Corporation, Control Div.
d. Henry Valve Company.
e. Parker-Hannifin Corporation, Refrigeration and Air Conditioning Division.
f. Sporlan Valve Company.

2.2 PIPE AND TUBING MATERIALS

A. Copper Tubing: ASTM B280, Type ACR, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interiors prior to shipping.

B. Copper Tubing: ASTM B88, Type L, hard-drawn straight lengths, and soft-annealed coils, seamless copper tubing.

2.3 FITTINGS

A. Wrought-Copper Fittings: ANSI B16.22, streamlined pattern.

2.4 JOINING MATERIALS

A. Brazing Filler Metals: Construct joints according to AWS A5.8.
   1. Use Type BCuP (copper-phosphorus) alloy for joining copper socket fittings with copper pipe.
   2. Use BAg (cadmium-free silver) alloy for joining copper with bronze or steel.

2.5 VALVES

A. General: Complete valve assembly shall be UL-listed and designed to conform to ARI 760.

B. Globe: 450-psig maximum operating pressure, 275 DegF maximum operating temperature; cast bronze body, with cast bronze or forged brass wing cap and bolted bonnet; replaceable resilient seat disc; plated steel stem. Valve shall be capable of being repacked under pressure. Valve shall be straight through or angle pattern, with solder-end connections.

C. Check Valves - Smaller than 7/8 inch: 500-psig maximum operating pressure, 300 DegF maximum operating temperature; cast brass body, with removable piston, Teflon seat, and stainless steel spring; straight through globe design. Valve shall be straight through pattern, with solder-end connections.

D. Check Valves - 7/8 inch and Larger: 450-psig maximum operating pressure, 300 DegF maximum operating temperature; cast bronze body, with cast bronze or forged brass bolted bonnet; floating piston with mechanically retained Teflon seat disc. Valve shall be straight through or angle pattern, with solder-end connections.

E. Solenoid Valves: 250 DegF temperature rating, 400-psig working pressure; forged brass, with Teflon valve seat, 2-way straight through pattern, and solder end connections. Provide manual operator to open valve. Furnish complete with NEMA 1 solenoid enclosure with 1/2-inch conduit adapter, and 24 volts, 60 Hertz, normally closed holding coil.

F. Evaporator Pressure Regulating Valves: pilot-operated, forged brass or cast bronze; complete with pilot operator, stainless steel bottom spring, pressure gage tappings, 24 VDC, 50/60 Hertz, standard coil; and wrought copper fittings for solder end connections.

G. Thermal Expansion Valves: thermostatic adjustable, modulating type; size as required for specific evaporator requirements, and factory set for proper evaporator superheat requirements. Valves shall
have copper fittings for solder end connections; complete with sensing bulb, a distributor having a side connection for hot gas bypass line, and an external equalizer line.

H. Hot Gas Bypass Valve: adjustable type, sized to provide capacity reduction beyond the last step of compressor unloading; and wrought copper fittings for solder end connections.

2.6 REFRIGERANT PIPING SPECIALTIES

A. General: Complete refrigerant piping specialty assembly shall be UL-listed and designed to conform to ARI 760.

B. Strainers: 500-psig maximum working pressure; forged brass body with monel 80-mesh screen, and screwed cleanout plug; Y-pattern, with solder end connections.

C. Moisture/liquid Indicators: 500-psig maximum operation pressure, 200 DegF maximum operating temperature; forged brass body, with replaceable polished optical viewing window, and solder end connections.

D. Filter-driers: 500-psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter-drier core kit, including gaskets, as follows:
   1. Standard capacity desiccant sieves to provide micronic filtration.
   2. High capacity desiccant sieves to provide micronic filtration and extra drying capacity.

E. Suction Line Filter-Drier: 350-psig maximum operation pressure, 225 DegF maximum operating temperature; steel shell, and wrought copper fittings for solder end connections. Permanent filter element shall be molded felt core surrounded by a desiccant for removal of acids and moisture for refrigerant vapor.

F. Suction Line Filters: 500-psig maximum operation pressure; steel shell, flange ring, and spring, ductile iron cover plate with steel capscrews, and wrought copper fittings for solder end connections. Furnish complete with replaceable filter core kit, including gaskets, as follows:

G. Flanged Unions: 400-psig maximum working pressure, 330 DegF maximum operating temperature; two brass tailpiece adapters for solder end connections to copper tubing; flanges for 7/8-inch through 1-5/8-inch unions shall be forged steel, and for 2-1/8-inch through 3-1/8-inch shall be ductile iron; four plated steel bolts, with silicon bronze nuts and fiber gasket. Flanges and bolts shall have factory-applied rust-resistant coating.

H. Flexible Connectors: 500-psig maximum operating pressure; seamless tin bronze or stainless steel core, high tensile bronze braid covering, solder connections, and synthetic covering; dehydrated, pressure tested, minimum 7 inches in length.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation.
3.2 PIPE APPLICATIONS

A. Use Type L, or Type ACR drawn copper tubing with wrought copper fittings and brazed joints above ground, within building. Use Type K, annealed temper copper tubing for 2 inches and smaller without joints, below ground and within slabs. Mechanical fittings (crimp or flair) are not permitted.
   1. Install annealed temper tubing in pipe duct. Vent pipe duct to the outside.

B. If other than Type ACR tubing is used, clean and protect inside of tubing as specified in Article "CLEANING" below.

3.3 PIPING INSTALLATIONS


B. Install piping in as short and direct arrangement as possible to minimize pressure drop.

C. Install piping for minimum number of joints using as few elbows and other fitting as possible.

D. Arrange piping to allow normal inspection and servicing of compressor and other equipment. Install valves and specialties in accessible locations to allow for servicing and inspection.

E. Provide adequate clearance between pipe and adjacent walls and hanger, or between pipes for insulation installation. Use sleeves through floors, walls, or ceilings, sized to permit installation of full thickness insulation.

F. Insulate suction lines. Liquid lines are not required to be insulated, except where they are installed adjacent and clamped to suction lines, where both liquid and suction lines shall be insulated as a unit.
   1. Do not install insulation until system testing has been completed and all leaks have been eliminated.

G. Install branch tie-in lines to parallel compressors equal length, and pipe identically and symmetrically.

H. Install copper tubing in rigid or flexible conduit in locations where copper tubing will be exposed to mechanical injury.

I. Slope refrigerant piping as follows:
   1. Install horizontal hot gas discharge piping with 1/2 inch per 10 feet downward slope away from the compressor.
   2. Install horizontal suction lines with 1/2 inch per 10 feet downward slope to the compressor, with no long traps or dead ends which may cause oil to separate from the suction gas and return to the compressor in damaging slugs.
   3. Install traps and double risers where indicated, and where required to entrain oil in vertical runs.
   4. Liquid lines may be install level.

J. Use fittings for all changes in direction and all branch connections.

K. Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless expressly indicated.
L. Install piping free of sags or bends and with ample space between piping to permit proper insulation applications.

M. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to view.

N. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation applications, with 1-inch clearance outside the insulation. Allow sufficient space above removable ceiling panels to allow for panel removal.

O. Locate groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

P. Exterior Wall Penetrations: Seal pipe penetrations through exterior walls using sleeves and mechanical sleeve seals. Pipe sleeves smaller than 6 inches shall be steel; pipe sleeves 6 inches and larger shall be sheet metal.

Q. Fire Barrier Penetrations: Where pipes pass through fire rated walls, partitions, ceilings, and floors, maintain the fire rated integrity. Refer to Division 7 for special sealers and materials.

R. Make reductions in pipe sizes using eccentric reducer fittings installed with the level side down.

S. Install strainers immediately ahead of each expansion valve, solenoid valve, hot gas bypass valve, compressor suction valve, and as required to protect refrigerant piping system components.

T. Install moisture/liquid indicators in liquid lines between filter/driers and thermostatic expansion valves and in liquid line to receiver.
   1. Install moisture/liquid indicators in lines larger than 2-1/8-inch OD using a bypass line.

U. Install unions to allow removal of solenoid valves, pressure regulating valves, expansion valves, and at connections to compressors and evaporators.

V. Install flexible connectors at the inlet and discharge connection of compressors.

3.4 HANGERS AND SUPPORTS

A. General: Hangers, supports, and anchors are specified in other Sections. Conform to the table below for maximum spacing of supports.

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet in length.
   2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
   3. Pipe rollers complete supports for multiple horizontal runs, 20 feet or longer supported by a trapeze.
   4. Spring hangers to support vertical runs.

C. Install hangers with the following minimum rod sizes and maximum spacing:

<table>
<thead>
<tr>
<th>NOMINAL PIPE SIZE (INCHES)</th>
<th>MAXIMUM SPAN (FEET)</th>
<th>MINIMUM ROD SIZE (INCHES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 1-1/4</td>
<td>6</td>
<td>3/8</td>
</tr>
<tr>
<td>&gt;= 1-1/2</td>
<td>10</td>
<td>3/8</td>
</tr>
</tbody>
</table>
D. Support vertical runs at each floor or every 10 feet, whichever is shorter.

3.5 PIPE JOINT CONSTRUCTION

A. Brazed Joints: Comply with the procedures contained in the AWS “Brazing Manual.”
   1. WARNING: Some filler metals contain compounds which produce highly toxic fumes when heated. Avoid breathing fumes. Provide adequate ventilation.
   2. CAUTION: When solenoid valves are being installed, remove the coil to prevent damage. When sight glasses are being installed, remove the glass. Remove stems, seats, and packing of valves, and accessible internal parts of refrigerant specialties before brazing. Do not apply heat near the bulb of the expansion valve.

B. Fill the pipe and fittings during brazing, with an inert gas (i.e., nitrogen or carbon dioxide) to prevent formation of scale.

C. Heat joints using oxy-acetylene torch. Heat to proper and uniform brazing temperature.

3.6 VALVE INSTALLATIONS

A. General: Install refrigerant valves where indicated, and in accordance with manufacturer’s instructions.

B. Install globe valves on each side of strainers and driers, in liquid and suction lines at evaporators, and elsewhere as indicated.

C. Install a full sized, 3-valve bypass around each drier.

D. Install solenoid valves ahead of each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at the top.
   1. Electrical wiring for solenoid valves is specified in Division 26. Coordinate electrical requirements and connections.

E. Thermostatic expansion valves may be mounted in any position, as close as possible to the evaporator.
   1. Where refrigerant distributors are used, mount the distributor directly on the expansion valve outlet.
   2. Install the valve in such a location so that the diaphragm case is warmer than the bulb.
   3. Secure the bulb to a clean, straight, horizontal section of the suction line using two bulb straps. Do not mount bulb in a trap or at the bottom of the line.
   4. Where external equalizer lines are required make the connection where it will clearly reflect the pressure existing in the suction line at the bulb location.

F. Install pressure regulating and relieving valves as required by ASHRAE Standard 15.

3.7 EQUIPMENT CONNECTIONS

A. The Drawings indicate the general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow servicing and maintenance.
3.8 FIELD QUALITY CONTROL

A. Inspect, test, and perform corrective action of refrigerant piping in accordance with ASME Code B31.5, Chapter VI.

B. Repair leaking joints using new materials, and retest for leaks.

3.9 CLEANING

A. Before installation of copper tubing other than Type ACR tubing, clean the tubing and fitting using following cleaning procedure:
   1. Remove coarse particles of dirt and dust by drawing a clean, lintless cloth through the tubing by means of a wire or an electrician’s tape.
   2. Draw a clean, lintless cloth saturated with trichloroethylene through the tube or pipe. Continue this procedure until cloth is not discolored by dirt.
   3. Draw a clean, lintless cloth, saturated with compressor oil, squeezed dry, through the tube or pipe to remove remaining lint. Inspect tube or pipe visually for remaining dirt and lint.
   4. Finally, draw a clean, dry, lintless cloth through the tube or pipe.

3.10 ADJUSTING AND CLEANING

A. Verify actual evaporator applications and operating conditions and adjust thermostatic expansion valve to obtain proper evaporator superheat requirements.

B. Clean and inspect refrigerant piping systems.

C. Adjust controls and safeties. Replace damaged or malfunctioning controls and equipment with new materials and products.

3.11 COMMISSIONING

A. Charge system using the following procedure:
   1. Install core in filter dryer after leak test but before evacuation.
   2. Evacuate refrigerant system with vacuum pump; until temperature of 35 DegF is indicated on vacuum dehydration indicator.
   3. During evacuation, apply heat to pockets, elbows, and low spots in piping.
   4. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.
   5. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.
   6. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.

B. Train Owner’s maintenance personnel on procedures and schedules related to start-up and shut-down, troubleshooting, servicing, and preventative maintenance of refrigerant piping valves and refrigerant piping specialties.

C. Review data in Operating and Maintenance Manuals.

D. Schedule training with Owner through the Architect, with at least 7 days’ advance notice.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch w.g. (minus 500 to plus 2490 Pa).

1.2 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x DegF or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1.3 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Engineer. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

1.4 SUBMITTALS

A. Product Data: For duct material, liner and sealing materials.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
   1. Ceiling suspension assembly members.
   2. Other systems installed in same space as ducts.
   3. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
   4. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

C. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

E. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

1.5 QUALITY ASSURANCE


1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle sealant and firestopping materials according to manufacturer’s written recommendations.

C. Deliver and store stainless-steel sheets with mill-applied adhesive protective paper maintained through fabrication and installation.

PART 2 – PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A653/A653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Carbon-Steel Sheets: ASTM A366/A366M, cold-rolled sheets; commercial quality; with oiled, exposed matte finish.

C. Stainless Steel: ASTM A480/A480M, Type 316, sheet form with No. 4 finish for surfaces of ducts exposed to view; and Type 304, sheet form with No. 1 finish for concealed ducts.

D. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

E. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 DUCT LINER

A. General: Comply with NFPA 90A or NFPA 90B and NAIMA’s “Fibrous Glass Duct Liner Standard.”

B. Materials: ASTM C1071 with coated surface exposed to airstream to prevent erosion of glass fibers.
   1. Thickness: 1 inch (25 mm).
   2. Thermal Conductivity (k-Value): 0.26 at 75 DegF (0.037 at 24 DegC) mean temperature.
   3. Fire-Hazard Classification: Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM C411.
   4. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and ASTM C916.
   5. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.
      a. Tensile Strength: Indefinitely sustain a 50-pound (23-kg) tensile, dead-load test perpendicular to duct wall.
b. Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch (3 mm) into airstream.
c. Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.

2.3 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term “sealant” is limited to materials of adhesive or mastic nature.
   1. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 66 percent solids.
   2. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

2.4 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.
   1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
   2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.
   1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
   2. Straps and Rod Sizes: Comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible” for sheet steel width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A36/A36M.

2.5 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible.” Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
   1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
   2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Fabricate kitchen hood exhaust ducts with 0.0598-inch- (1.5-mm-) thick, carbon-steel sheet for concealed ducts and 0.0500-inch- (1.3-mm-) thick stainless steel for exposed ducts. Weld and flange seams and joints. Comply with NFPA 96.

C. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:
1. Supply Ducts: 3-inch w.g. (750 Pa).
2. Return Ducts: 2-inch w.g. (500 Pa), negative pressure.
3. Exhaust Ducts: 2-inch w.g. (500 Pa), negative pressure.

D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359-inch (0.9-mm) thick or less, with more than 10 square feet (0.93 sq. m) of unbraced panel area, unless ducts are lined.

2.6 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.

B. Apply adhesive to liner facing in direction of airflow not receiving metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).

G. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely around perimeter; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or “Z” profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:
   1. Fan discharge.
   2. Intervals of lined duct preceding unlined duct.
   3. Upstream edges of transverse joints in ducts.

I. Secure insulation liner with perforated sheet metal liner of same metal thickness as specified for duct, secured to ducts with mechanical fasteners that maintain metal liner distance from duct without compressing insulation.
   1. Sheet Metal Liner Perforations: 3/32-inch (2.4-mm) diameter with an overall open area of 23 percent.

J. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

2.7 ROUND DUCT FABRICATION

A. General: Diameter as indicated on the plans.

B. Round Ducts: Fabricate supply ducts of galvanized steel according to SMACNA’s “HVAC Duct Construction Standards–Metal and Flexible.”
2.8 ROUND SUPPLY AND EXHAUST FITTING FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible,” with metal thicknesses specified for longitudinal seam straight duct.

B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.

C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate bend radius of die-formed, gored, and pleated elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible,” unless otherwise indicated.

2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):
   a. Ducts 3 to 26 Inches (75 to 660 mm) in Diameter: 0.028 inch (0.7 mm).
   b. Ducts 27 to 36 Inches (685 to 915 mm) in Diameter: 0.034 inch (0.85 mm).

3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg (500 to 2490 Pa):
   a. Ducts 3 to 14 Inches (75 to 355 mm) in Diameter: 0.028 inch (0.7 mm).
   b. Ducts 15 to 26 Inches (380 to 660 mm) in Diameter: 0.034 inch (0.85 mm).
   c. Ducts 27 to 50 Inches (685 to 1270 mm) in Diameter: 0.040 inch (1.0 mm).

4. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material-handling classes A and B; and only where space restrictions do not permit using 1.5 bend radius elbows. Fabricate with single-thickness turning vanes.

5. Round Elbows, 8 Inches (200 mm) and Smaller: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.

6. Round Elbows, 9 through 14 Inches (225 through 355 mm): Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees, unless space restrictions require a mitered elbow. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.

7. Round Elbows, Larger than 14 Inches (355 mm), and All Flat-Oval Elbows: Fabricate gored elbows, unless space restrictions require a mitered elbow.

8. Die-Formed Elbows for Sizes through 8 Inches (200 mm) and All Pressures: 0.040 inch (1.0 mm) thick with two-piece welded construction.

9. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.

10. Pleated Elbows for Sizes through 14 Inches (355 mm) and Pressures through 10-Inch w.g. (2490 Pa): 0.022 inch (0.55 mm).

PART 3 – EXECUTION

3.1 DUCT INSTALLATION, GENERAL

A. Drawings indicate general arrangement of ducts, fittings, and accessories. Provide all required fittings, accessories, and ancillaries as required for a complete system as determined by the Engineer.

B. Construct and install each duct system for the specific duct pressure classification indicated.
C. Install round ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.
D. Install ducts with fewest possible joints.
E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.
F. Install couplings tight to duct wall surface with a minimum of projections into duct.
G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.
H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
I. Install ducts with a clearance of 1 inch (25 mm) plus allowance for insulation thickness.
J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.
K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches (38 mm).
N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Refer to other sections for fire damper specifications as well as fire stopping specifications.
O. Smoke-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated smoke damper, sleeve, and firestopping sealant. Refer to other sections for smoke damper specifications as well as fire stopping specifications.

3.2 KITCHEN HOOD EXHAUST DUCT INSTALLATIONS
A. Install ducts to allow for thermal expansion of ductwork through 2000 DegF (1100 DegC) temperature range.
B. Install ducts without dips or traps that may collect residues, unless traps have continuous or automatic residue removal.
C. Install access openings at each change in direction and at 50-foot (15-m) intervals; locate on sides of duct a minimum of 1-1/2 inches (38 mm) from bottom; and fit with grease-tight covers of same material as duct.
D. Do not penetrate fire-rated assemblies.
3.3 SEAM AND JOINT SEALING

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA’s “HVAC Duct Construction Standards–Metal and Flexible.”

B. Pressure Classification Less than 2-Inch w.g. (500 Pa): Transverse joints.

C. Seal externally insulated ducts before insulation installation.

3.4 HANGING AND SUPPORTING

A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA’s “HVAC Duct Construction Standards–Metal and Flexible.”

B. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet (5 m) and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

E. Install concrete inserts before placing concrete.

F. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

3.5 CONNECTIONS

A. Connect equipment with flexible connectors according to other Sections.

B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible.”

3.6 FIELD QUALITY CONTROL

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. Conduct tests, in presence of Architect, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days’ advance notice for testing.

C. Determine leakage from entire system or section of system by relating leakage to surface area of test section.

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round and flat-oval ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch w.g. (500 Pa) (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch w.g. (500 to 2490 Pa).

E. Remake leaking joints and retest until leakage is less than maximum allowable.

F. Leakage Test: Perform tests according to SMACNA’s "HVAC Air Duct Leakage Test Manual."
3.7 ADJUSTING

A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow.

B. Detailed procedures for Testing, Adjusting, and Balancing are specified in other Sections.

3.8 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Backdraft dampers.
   3. Fire and smoke dampers.
   4. Turning vanes.
   5. Duct-mounted access doors and panels.
   6. Flexible ducts.
   7. Flexible connectors.
   8. Duct accessory hardware.

1.2 SUBMITTALS

A. Product Data: For the following:
   1. Backdraft dampers.
   3. Fire and smoke dampers.
   4. Duct silencers.
   5. Duct-mounted access doors and panels.
   6. Flexible ducts.

B. Product Certificates: Submit certified test data on dynamic insertion loss; self-noise power levels; and airflow performance data, static-pressure loss, dimensions, and weights.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Comply with the following NFPA standards:
   2. NFPA 90B, “Installation of Warm Air Heating and Air Conditioning Systems.”

1.4 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 – PRODUCTS

2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A653/A653M, G90 (Z275) coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.
B. Carbon-Steel Sheets: ASTM A366/A366M, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

C. Aluminum Sheets: ASTM B209 (ASTM B209M), Alloy 3003, Temper H14, sheet form; with standard, one-side bright finish for ducts exposed to view and mill finish for concealed ducts.


E. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for 36-inch (900-mm) length or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT DAMPERS

A. Description: Suitable for horizontal or vertical installations.

B. Frame: 0.052-inch (1.3-mm) thick, galvanized, sheet steel with welded corners and mounting flange.

C. Blades: 0.025-inch (0.6-mm) thick, roll-formed aluminum.

D. Blade Seals: Neoprene.

E. Blade Axles: Galvanized steel.

F. Tie Bars and Brackets: Galvanized steel.

G. Return Spring: Adjustable tension.

2.3 MANUAL-VOLUME DAMPERS

A. General: Factory fabricated with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classifications of 3-inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

B. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

C. Low-Leakage Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, low-leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

D. Jackshaft: 1-inch (25-mm) diameter, galvanized steel pipe rotating within a pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.

1. Length and Number of Mountings: Appropriate to connect linkage of each damper of a multiple-damper assembly.
E. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch (2.4-mm) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut. Include center hole to suit damper operating-rod size. Include elevated platform for insulated duct mounting.

2.4 FIRE DAMPERS

A. General: Labeled to UL 555.
B. Fire Rating: 1-1/2 hours.
C. Frame: SMACNA Type B with blades out of airstream; fabricated with roll-formed, 0.034-inch (0.85-mm) thick galvanized steel; with mitered and interlocking corners.
D. Mounting Sleeve: Factory- or field-installed galvanized, sheet steel.
   1. Minimum Thickness: 0.05-inch (1.3-mm) or 0.138-inch (3.5-mm) thick as indicated and length to suit application.
   2. Exceptions: Omit sleeve where damper frame width permits direct attachment of perimeter mounting angles on each side of wall or floor, and thickness of damper frame complies with sleeve requirements.
E. Mounting Orientation: Vertical or horizontal as indicated.
F. Blades: Roll-formed, interlocking, 0.034-inch (0.85-mm) thick, galvanized, sheet steel. In place of interlocking blades, use full-length, 0.034-inch (0.85-mm) thick, galvanized steel blade connectors.
G. Horizontal Dampers: Include a blade lock and stainless-steel negator closure spring.
H. Fusible Link: Replaceable, 165 or 212 DegF (74 or 100 DegC) rated as indicated.

2.5 SMOKE DAMPERS

A. General: Labeled to UL 555S. Combination fire and smoke dampers shall be labeled for one-and-one-half-hour rating to UL 555.
B. Fusible Link: Replaceable, 165 or 212 DegF (74 or 100 DegC) rated as indicated.
C. Frame and Blades: 0.064-inch (1.62-mm) thick, galvanized, sheet steel.
D. Mounting Sleeve: Factory-installed, 0.052-inch (1.3-mm) thick, galvanized, sheet steel; length to suit wall or floor application.
E. Damper Motors: Provide for modulating or two-position action.
   1. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
   2. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
   3. Two-Position Motor: 115 volt, single phase, 60 Hertz.

2.6 TURNING VANES

A. Fabricate to comply with SMACNA’s “HVAC Duct Construction Standards--Metal and Flexible.”
B. Manufactured Turning Vanes: Fabricate of 1-1/2-inch (38-mm) wide, curved blades set 3/4 inch (19 mm) on center; support with bars perpendicular to blades set 2 inches (50 mm) on center; and set into side strips suitable for mounting in ducts.

C. Acoustic Turning Vanes: Fabricate of airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

2.7 DUCT-MOUNTED ACCESS DOORS AND PANELS
A. General: Fabricate doors and panels airtight and suitable for duct pressure class.

B. Frame: Galvanized, sheet steel, with bend-over tabs and foam gaskets.

C. Door: Double-wall, galvanized, sheet metal construction with insulation fill and thickness, and number of hinges and locks as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch (25-mm) thick, fibrous-glass or polystyrene-foam board.

2.8 FLEXIBLE CONNECTORS
A. General: Flame-retarded or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

1. Standard Metal-Edged Connectors: Factory fabricated with a strip of fabric 3-1/2 inches (89 mm) wide attached to two strips of 2-3/4-inch (70-mm) wide, 0.028-inch (0.7-mm) thick, galvanized, sheet steel or 0.032-inch (0.8-mm) aluminum sheets. Select metal compatible with connected ducts.


1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).

2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp, and 360 lbf/inch (63 N/mm) in the filling.

2.9 FLEXIBLE DUCTS
A. General: Comply with UL 181, Class 1.

B. Flexible Ducts, Uninsulated: Spiral-wound steel spring with flameproof vinyl sheathing.

C. Flexible Ducts, Uninsulated: Corrugated aluminum.

D. Flexible Ducts, Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing 1-1/2-inch (38-mm) thick, glass-fiber insulation around a continuous inner liner.

1. Reinforcement: Steel-wire helix encapsulated in inner liner.

2. Outer Jacket: Glass-reinforced, silver Mylar with a continuous hanging tab, integral fibrous-glass tape, and nylon hanging cord.

3. Inner Liner: Polyethylene film.

E. Pressure Rating: 6-inch w.g. (1500 Pa) positive, 1/2-inch w.g. (125 Pa) negative.
2.10 ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments, and length to suit duct insulation thickness.

B. Splitter Damper Accessories: Zinc-plated damper blade bracket; 1/4-inch (6-mm), zinc-plated operating rod; and a duct-mounted, ball-joint bracket with flat rubber gasket and square-head set screw.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 to 18 inches (75 to 450 mm) to suit duct size.

D. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details shown in SMACNA’s “HVAC Duct Construction Standards—Metal and Flexible” for metal ducts and NAIMA’s “Fibrous Glass Duct Construction Standards” for fibrous-glass ducts.

B. Install volume dampers in lined duct; avoid damage to and erosion of duct liner.

C. Provide test holes at fan inlet and outlet and elsewhere as indicated.

D. Install fire and smoke dampers according to manufacturer’s UL-approved written instructions.
   1. Install fusible links in fire dampers.

E. Install duct access panels for access to both sides of duct coils. Install duct access panels downstream from volume dampers, fire dampers, turning vanes, and equipment.
   1. Install duct access panels to allow access to interior of ducts for cleaning, inspecting, adjusting, and maintaining accessories and terminal units.
   2. Install access panels on side of duct where adequate clearance is available.

F. Label access doors according to other Sections.

G. Flexible ducts shall be a maximum length of 4 feet. Provide a rigid elbow at connection to ceiling mounted registers, diffusers, and grilles. Flexible ducts shall only be used on supply air ductwork systems. Flexible ducts shall not be used on return and exhaust air systems.

3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in other Sections.
END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following types fans:

1.2 SUBMITTALS

A. Product data for selected models, including specialties, accessories, and the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound power ratings.
   3. Motor ratings and electrical characteristics plus motor and fan accessories.
   4. Materials gages and finishes including color charts.
   5. Dampers, including housings, linkages, and operators.

B. Assembly drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, required clearances, components, and location and size of field connections.

C. Wiring diagrams that detail power, signal, and control wiring. Differentiate between manufacturer-installed wiring and field-installed wiring.

D. Maintenance data:

1.3 QUALITY ASSURANCE

A. UL Compliance: Fans and components shall be UL listed and labeled.

B. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

C. Electrical Component Standard: Components and installation shall comply with NFPA 70 “National Electrical Code.”

1.4 EXTRA MATERIALS

A. Furnish one additional complete set of belts for each belt-driven fan.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Centrifugal Roof Ventilators:
      a. Carnes Company, Inc.
      b. Cook (Loren) Co.
      c. Greenheck Fan Corp.
2. Upblast Propeller Roof Exhaust Fans:
   a. Carnes Company, Inc.
   b. Cook (Loren) Co.
   c. Greenheck Fan Corp.

2.2 SOURCE QUALITY CONTROL

A. Testing Requirements: The following factory tests are required:
   2. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings in accordance with AMCA Standard 210/ASHRAE Standard 51, “Laboratory Methods of Testing Fans for Rating.”

2.3 FANS, GENERAL

A. General: Provide fans that are factory fabricated and assembled, factory tested, and factory finished, with indicated capacities and characteristics.

B. Fans and Shafts: Statically and dynamically balanced and designed for continuous operation at the maximum rated fan speed and motor horsepower.
   1. Fan Shaft: Turned, ground, and polished steel designed to operate at no more than 70 percent of the first critical speed at the top of the speed range of the fan’s class.

C. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

D. Belts: Oil-resistant, non-sparking, and non-static.

E. Motor and Fan Wheel Pulleys: Adjustable pitch for use with motors. Select pulley so that pitch adjustment is at the middle of the adjustment range at fan design conditions.
   1. Belt Guards: Provide steel belt guards for motors mounted on the outside of the fan cabinet.

F. Shaft Bearings: Provide type indicated, having a median life “Rating Life” (AFBMA (L50)) of 200,000, calculated in accordance with AFBMA Standard 9 for ball bearings and AFBMA Standard 11 for roller bearings.

G. Factory Finish: The following finishes are required:
   1. Sheet Metal Parts: Prime coating prior to final assembly.
   2. Exterior Surfaces: Baked-enamel finish coat after assembly.

H. Motors:
   1. Refer to other Sections for motor equipment.

2.4 CENTRIFUGAL ROOF VENTILATORS

A. General Description: Belt-driven or direct-drive as indicated, centrifugal consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, curb base, and accessories.
B. Housing: Heavy-gage, removable, spun-aluminum, dome top, and outlet baffle; square, one-piece, hinged, aluminum base with venturi inlet cone.
   1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.

C. Fan Wheel: Aluminum hub and wheel with backward-inclined blades.

D. Belt-Driven Drive Assembly (Where applicable): Resiliently mounted to the housing, with the following features:
   1. Pulleys: Cast-iron, adjustable-pitch.
   3. Fan Shaft: Turned, ground, and polished steel drive shaft keyed to wheel hub.
   4. Fan and motor isolated from exhaust air stream.

E. Motor shall be open drip proof type.

F. Accessories: The following items are required as indicated:
   1. Disconnect Switch: Non-fusible type, with thermal overload protection mounted inside fan housing, factory-wired through an internal aluminum conduit.
   2. Bird Screens: Removable 1/2-inch mesh, 16-gage, aluminum or brass wire.
      b. Frame: Extruded aluminum, with waterproof, felt blade seals.
      c. Linkage: Nonferrous metals, connecting blades to counter weight or operator.
      d. Operators: Manufacturer’s standard electric motor.
   4. Roof Curbs: Prefabricated, heavy-gage, galvanized steel; mitered and welded corners; 2-inch-thick, rigid, fiberglass insulation adhered to inside walls; built-in cant and mounting flange for flat roof decks; and 2-inch wood nailer. Size as required to suit roof opening and fan base.
      a. Overall Height: 24 inches.

2.5 MOTORS

A. Torque Characteristics: Sufficient to accelerate the driven loads satisfactorily.

B. Motor Sizes: Minimum sizes and electrical characteristics as indicated. If not indicated, large enough so that the driven load will not require the motor to operate in the service factor range.

C. Temperature Rating: 50 DegC maximum temperature rise at 40 DegC ambient for continuous duty at full load (Class A Insulation).

D. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.

E. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design B. Provide permanent-split capacitor classification motors for shaft-mounted fans and capacitor start classification for belted fans.
   2. Bearings: The following features are required:
      a. Ball or roller bearings with inner and outer shaft seals.
      b. Grease lubricated.
c. Designed to resist thrust loading where belt drives or other drives produce lateral or axial thrust in motor.

3. Enclosure Type: The following features are required:
   a. Open dripproof motors where satisfactorily housed or remotely located during operation.
   b. Guarded dripproof motors where exposed to contact by employees or building occupants.

4. Overload protection: Built-in, automatic reset, thermal overload protection.

5. Noise rating: Quiet.

6. Efficiency: Energy-efficient motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, Test Method B. If efficiency not specified, motors shall have a higher efficiency than “average standard industry motors” in accordance with IEEE Standard 112, Test Method B.

7. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, and special features.

F. Starters, Electrical Devices, and Wiring: Electrical devices and connections are specified in other Sections.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances, housekeeping pads, and other conditions affecting performance of fans.

B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install fans level and plumb, in accordance with manufacturer’s written instructions. Support units as described below, using the vibration control devices indicated. Vibration control devices are specified in Section "Mechanical Vibration Controls and Seismic Restraints."
   1. Support floor-mounted units on concrete equipment bases using neoprene pads. Secure units to anchor bolts installed in concrete equipment base.
   2. Support floor-mounted units on concrete equipment bases using housed spring isolators. Secure units to anchor bolts installed in concrete equipment base.
   3. Secure roof-mounted fans to roof curbs with cadmium-plated hardware.
      a. Installation of roof curbs is specified in other Sections.
   4. Suspended Units: Suspend units from structural steel support frame using threaded steel rods and vibration isolation springs.

B. Arrange installation of units to provide access space around air-handling units for service and maintenance.

3.3 CONNECTIONS

A. Duct installations and connections are specified in other Sections. Make final duct connections with flexible connections.

B. Electrical Connections: The following requirements apply:
   1. Electrical power wiring is specified in other Divisions.
2. Temperature control wiring and interlock wiring are specified in Division 23.
3. Grounding: Connect unit components to ground in accordance with the National Electrical Code.

3.4 FIELD QUALITY CONTROL

A. Manufacturer’s Field Inspection: Arrange and pay for a factory-authorized service representative to perform the following:
   1. Inspect the field assembly of components and installation of fans including ductwork and electrical connections.
   2. Prepare a written report on findings and recommended corrective actions.

3.5 ADJUSTING, CLEANING, AND PROTECTING

A. Adjust damper linkages for proper damper operation.

B. Clean unit cabinet interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheel and cabinet.

3.6 COMMISSIONING

A. Final Checks Before Start-Up: Perform the following operations and checks before start-up:
   1. Remove shipping blocking and bracing.
   2. Verify unit is secure on mountings and supporting devices and that connections for piping, ductwork, and electrical are complete. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
   3. Perform cleaning and adjusting specified in this Section.
   4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearings operations. Reconnect fan drive system, align belts, and install belt guards.
   5. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
   6. Verify manual and automatic volume control and that fire and smoke dampers in connected ductwork systems are in the full-open position.
   7. Disable automatic temperature control operators.

B. Starting procedures for fans:
   1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated RPM.
      a. Replace fan and motor pulleys as required to achieve design conditions.
   2. Measure and record motor electrical values for voltage and amperage.

C. Shut unit down and reconnect automatic temperature control operators.

D. Refer to Division 23 Section “Testing, Adjusting, and Balancing” for procedures for air-handling-system testing, adjusting, and balancing.
3.7 DEMONSTRATION

A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner’s maintenance personnel on the following:

1. Procedures and schedules related to start-up and shutdown, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
2. Familiarization with contents of Operating and Maintenance Manuals.

B. Schedule training with at least 7 days’ advance notice.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:
   2. Fan-powered air terminals.

1.2 SUBMITTALS

A. Product Data: Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories for each model indicated. Include a schedule showing drawing designation, room location, number furnished, model number, size, and accessories furnished.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating air outlets with other items installed in ceilings.

C. Maintenance Data: List of parts for each type of air terminal and troubleshooting maintenance guide to include in the maintenance manuals specified in Division 1.

1.3 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate requirements of air terminals and are based on specific systems indicated. Other manufacturers’ systems with equal performance characteristics may be considered.

B. Listing and Labeling: Provide electrically operated air terminals specified in this Section that are listed and labeled.
   1. The Terms “Listed” and “Labeled”: As defined in NFPA 70, Article 100.


D. Comply with NFPA 70 for electrical components and installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering air terminals that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide air terminals by one of the following:
   1. Acutherm.
   2. Air System Components; Krueger Div.
3. Anemostat Products Div.
4. Carnes Co., Inc.
5. Carrier Corp.
7. Nailor Industries Inc.
8. Phoenix Controls Corp.
10. Trane Co. (The).
11. Trox USA, Inc.

2.2 SINGLE-DUCT AIR TERMINALS

A. Configuration: Volume-damper assembly inside unit casing. Locate control components inside protective metal shroud.

B. Casings: Steel or aluminum sheet metal of the following minimum thicknesses:
1. Upstream Pressure Side: 0.0239-inch (0.6-mm) steel.
2. Downstream Pressure Side: 0.0179-inch (0.45-mm) steel.

C. Casing Lining: Minimum of 1/2-inch (13-mm-) thick, neoprene- or vinyl-coated, fibrous-glass insulation; 1.5-pound/cubic foot (24-kg/cu. m) density, complying with NFPA 90A requirements and UL 181 erosion requirements. Secure lining to prevent delamination, sagging, or settling.
1. Coat liner surfaces and edges with erosion-resistant coating or cover with perforated metal.

D. Plenum Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.

E. Plenum Air Outlets: S-slip and drive connections.

F. Access: Removable panels to permit access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.

G. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings.
1. Maximum Damper Leakage: 2 percent of nominal airflow at 1-inch w.g. (250-Pa) inlet static pressure.

H. Attenuator Section: Line with 2-inch (50-mm-) thick, neoprene- or vinyl-coated, fibrous-glass insulation.

I. Multioutlet Attenuator Section: With 6-inch (150-mm-) diameter collars; each with locking butterfly balancing damper.

J. Multioutlet Attenuator Section: With 8-inch (200-mm-) diameter collars; each with locking butterfly balancing damper.

K. Round Outlet: Discharge collar matching inlet size.
L. Electric Heating Coil: Slip-in type, open-coil design with integral control box factory wired and installed. Include the following features:
   1. Primary and secondary overtemperature protection.
   3. Pneumatic-electric switches and relays.
   4. Magnetic contactor for each step of control.

M. Controls: Damper operator, thermostat, and other devices compatible with temperature controls specified in other Sections.

N. Electric Controls: 24-volt damper actuator with wall-mounted electric thermostat and appropriate mounting hardware.

O. Electronic Controls: Bidirectional damper operator and microprocessor-based controller with integral airflow transducer and room sensor provide control with the following features:
   1. Proportional plus integral control of room temperature.
   2. Time-proportional reheat-coil control.
   3. Occupied/unoccupied operating mode.
   4. Remote reset of airflow or temperature set points.
   5. Adjusting and monitoring with portable terminal.
   6. Communication with temperature-control system specified in other Sections.

2.3 FAN-POWERED AIR TERMINALS

A. Configuration: Volume-damper assembly and fan in series or in parallel arrangement inside unit casing. Locate control components inside protective metal shroud.

B. Casings: Steel or aluminum sheet metal of the following minimum thicknesses:
   1. Upstream Pressure Side: 0.0239-inch (0.6-mm) steel.
   2. Downstream Pressure Side: 0.0179-inch (0.45-mm) steel.

C. Casing Lining: Minimum of 1/2-inch- (13-mm-) thick, neoprene- or vinyl-coated, fibrous-glass insulation; 1.5-pound/cubic foot (24-kg/cu. m) density, complying with NFPA 90A requirements and UL 181 erosion requirements. Secure lining to prevent delamination, sagging, or settling.
   1. Coat liner surfaces and edges with erosion-resistant coating or cover with perforated metal.

D. Plenum Air Inlets: Round stub connections or S-slip and drive connections for duct attachment.

E. Plenum Air Outlets: S-slip and drive connections.

F. Access: Removable panels to permit access to dampers and other parts requiring service, adjustment, or maintenance; with airtight gasket and quarter-turn latches.

G. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings.
   1. Maximum Damper Leakage: 2 percent of nominal airflow at 1-inch w.g. (250-Pa) inlet static pressure.

H. Fan Section: Galvanized-steel plenum, acoustically lined, housing direct-drive, forward-curved fan with permanent split-capacitor motor, air filter, and backdraft damper.
   1. Speed Control: Infinitely adjustable with pneumatic-electric and electronic controls.
2. Isolation: Fan-motor assembly on rubber isolators.

I. Attenuator Section: Line with 2-inch-(50-mm-) thick, neoprene- or vinyl-coated, fibrous-glass insulation.

J. Electric Heating Coil: Slip-in type, open-coil design with integral control box factory wired and installed. Include the following features:
   1. Primary and secondary over-temperature protection.
   3. Pneumatic-electric switches and relays.
   4. Magnetic contactor for each step of control.

K. Factory-mounted and -wired controls: Mount electrical components in control box with removable cover. Incorporate single-point electrical connection to power source.
   1. Factory-mounted transformer for control voltage on electric and electronic control units with terminal strip in control box for field wiring of thermostat and power source.
   2. Wiring Terminations: Fan and controls to terminal strip, and terminal lugs to match quantities, sizes, and materials of branch-circuit conductors. Enclose terminal lugs in terminal box sized according to NFPA 70.

L. Control Panel Enclosure: NEMA 250, Type 1, with access panel sealed from airflow and mounted on side of unit.

M. Electric Controls: 24-volt damper actuator with wall-mounted electric thermostat and appropriate mounting hardware.

N. Electronic Controls: Bidirectional damper operator and microprocessor-based controller with integral airflow transducer and room sensor provide control with the following features:
   1. Proportional plus integral control of room temperature.
   2. Time-proportional reheat-coil control.
   3. Occupied/unoccupied operating mode.
   4. Remote reset of airflow or temperature set points.
   5. Adjusting and monitoring with portable terminal.
   6. Communication with temperature-control system specified in other Sections.

O. Factory-mounted electronic controls to accomplish the following sequence of operation:
   1. With central system fan operating in occupied mode, sequence the controls as follows:
      a. When primary duct pressure is sensed, thermostat and volume damper proportion airflow from central system.
      b. On reduced cooling demand, volume damper closes. At a field-adjustable point, fan is energized.
      c. As cooling demand increases, fan speed increases.
      d. If central duct system pressure varies, volume damper maintains constant primary airflow.
      e. If no cooling or heating demand, control enters field-adjustable, no-load band.
      f. On heating demand, heating coil is energized.
   2. With central system fan operating in unoccupied mode, sequence the controls as follows:
      a. Field-adjustable temperature setback.
      b. On heating demand, terminal unit fan and heating coil are energized.
c. Volume damper is closed.

3. With central system fan operating in occupied mode, sequence the controls as follows:
   a. On cooling demand, volume damper proportions airflow from central system.
   b. On reduced cooling demand, volume damper closes. Pneumatic-electric or damper-position switch energizes fan.
   c. Speed control adjusts fan speed to match downstream resistance.
   d. On heating demand, heating coil is energized.

4. With central system fan operating in unoccupied mode, sequence the controls as follows:
   a. Thermostat cycles fan.

2.4 SOURCE QUALITY CONTROL

   A. Testing Requirements: Test and rate air terminals according to ARI 880, “Industry Standard for Air Terminals.”
   
   B. Identification: Label each air terminal with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

PART 3 – EXECUTION

3.1 INSTALLATION

   A. Install air terminals level and plumb, according to manufacturer’s written instructions, rough-in drawings, original design, and referenced standards; and maintain sufficient clearance for normal service and maintenance.

   B. Connect ductwork to air terminals according to other Sections.

3.2 CONNECTIONS

   A. Electrical: Comply with applicable requirements in other Sections.

   B. Ground equipment.
   
   1. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. Where manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

   A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 CLEANING

   A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris, and repair damaged finishes.

3.5 COMMISSIONING

   A. Verify that installation of each air terminal is according to the Contract Documents.
B. Check that inlet duct connections are as recommended by air terminal manufacturer to achieve proper performance.

C. Check that controls and control enclosure are accessible.

D. Verify that control connections are complete.

E. Check that nameplate and identification tag are visible.

F. Verify that controls respond to inputs as specified.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner’s maintenance personnel as specified below:
   1. Train Owner’s maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
   2. Review data in the maintenance manuals. Refer to Section "Closeout Procedures."
   3. Review data in the maintenance manuals. Refer to Section “Operation and Maintenance Data.”
   4. Schedule training with Owner, through Architect, with at least 7 days’ advance notice.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1.2 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

1.3 SUBMITTALS

A. Product Data: For each model indicated, include the following:
1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

C. Samples for Initial Selection: Manufacturer’s color charts showing the full range of colors available for diffusers, registers, and grilles with factory-applied color finishes.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers’ products with equal performance characteristics may be considered.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

B. Acceptable Manufacturers:
   1. Titus.
   2. Anemostat.
   3. Carnes.
   5. Tutle & Bailey.

2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, “Method of Testing for Rating the Performance of Air Outlets and Inlets.”

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer’s written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of the panel. Where architectural features or other items conflict with installation, notify Engineer for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.
3.5 DIFFUSER/REGISTER/GRILLE SCHEDULE

General: Refer to drawings for appropriate device type and requirements.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Section includes packaged rooftop heating and cooling units.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer’s technical product data, including rated capacities of selected model clearly indicated, dimensions, required clearances, weights, furnished specialties and accessories; and installation and start-up instructions.

B. Shop Drawings:
   1. Submit shop drawings detailing the manufacturer’s electrical requirements for power supply wiring for rooftop heating and cooling units. Submit manufacturer’s ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
   2. Submit shop drawings detailing the mounting, securing, and flashing of the roof curb to the roof structure. Indicate coordinating requirements with roof membrane system.

C. Operation and Maintenance Data: Submit maintenance data and parts list for each rooftop unit, including “trouble-shooting” maintenance guide, servicing guide and preventative maintenance schedule and procedures.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firms regularly engaged in manufacture of rooftop heating and cooling units, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Regulatory Requirements:
   1. Gas-fired furnace section construction shall be in accordance with AGA safety standards. Furnace section shall bear the AGA label.
   2. Testing and rating of rooftop units of 135,000 btu/hr capacity or over shall be in accordance with ARI 360 “Standard for Commercial and Industrial Unitary Air-Conditioning Equipment.”
   3. Testing and rating of rooftop units under 135,000 btu/hr capacity shall be in accordance with ARI 210 “Standard for Unitary Air-Conditioning Equipment”, and provide Certified Rating Seal. Sound testing and rating of units shall be in accordance with ARI 270 “Standard for Sound Rating of Outdoor Unitary Equipment.” Units shall bear Certified Rating Seal.
   4. Refrigerating system construction of rooftop units shall be in accordance with ASHRAE 15 “Safety Code for Mechanical Refrigeration.”
   5. Energy Efficiency Ratio (EER) of rooftop units shall be equal to or greater than prescribed by ASHRAE 90.1 “Energy Standard for Buildings except Low-Rise Residential Buildings.”
   6. Rooftop units shall be listed by UL and have UL label as a unit.
1.4 SCHEDULING AND SEQUENCING

A. Coordinate installation of roof mounting curb as follows:
   1. Furnish curb adapter sized fit existing roof curb/opening.
   2. Installation of roof mounted equipment on the curb shall be by the Division 23 Contractor.

1.5 SPECIAL WARRANTY

A. Warranty on Compressor and Heat Exchanger: Provide written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, compressors and heat exchangers with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required; provided manufacturer’s instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation.
   1. Warranty Period: 5 years from date of substantial completion.

1.6 MAINTENANCE

A. Extra Materials: Furnish to Owner, with receipt, the following spare parts for each rooftop heating and cooling unit:
   1. One set of matched fan belts for each belt-driven fan.
   2. One set filters for each unit.

PART 2 – PRODUCTS

2.1 ROOFTOP UNITS LESS THAN 20 TONS

A. Manufacturers: Subject to compliance with requirements, provide rooftop units of one of the following:
   1. Carrier Air Conditioning; Div of Carrier Corp.
   2. Trane (The) Co; Div of American Standard Inc.
   4. Daikin McQuay)

B. General Description: Units shall be factory-assembled and tested, designed for roof or slab installation, and consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers. Capacities and electrical characteristics are scheduled on the Drawings.

C. Casing: Manufacturer’s standard casing construction, having corrosion protection coating, and exterior finish. Casings shall have removable panels or access doors for inspection and access to internal parts, a minimum of 1/2-inch-thick thermal insulation, knockouts for electrical and piping connections and an exterior condensate drain connection and lifting lugs.

D. Roof Curbs: Manufacturer’s standard construction, insulated and having corrosive protective coating, complete with factory-installed wood nailer and drain nipple. Construction shall be in accordance with NRCA Standards.

E. Evaporator fans: Forward-curved, centrifugal, belt-driven fans with adjustable sheaves or direct-driven fans; and permanently lubricated motor bearings.
F. Condenser fans: Propeller-type, direct-driven fans with permanently lubricated bearings.

G. Coils:
   1. General: Aluminum plate fin and seamless copper tube type. Fins shall have collars drawn, belled and firmly bonded to the tubes by means of mechanical expansion of the tubes. No soldering or tinning shall be used in the bonding process. Coils shall have a galvanized steel casing. Coils shall be mounted in the coil casing with same end connections accessible for service. Coils shall be removable from the unit through the roof or through the piping enclosure. Coil section shall be completely insulated.
   2. Refrigerant cooling coils: Have an equalizing type vertical distributor to ensure each coil circuit receives the same amount of refrigerant. Coils shall be proof (450 psig) and leak (300 psig) tested with air pressure under water, then cleaned, dehydrated, and sealed with a holding charge of nitrogen.

H. Compressors: Serviceable, fully hermetic compressors, complete with integral vibration isolators and crankcase heaters.

I. Safety controls: Manual reset type for:
   1. Low pressure cutout.
   2. High pressure cutout.
   3. Compressor motor overload protection.

J. Heat exchangers: Manufacturer’s standard construction for gas-fired heat exchangers and burners.
   1. Controls:
      a. Redundant gas valve.
      b. Electronic spark ignition system.
      c. High limit cutout.
      d. Forced draft proving switch.

K. Economizer control: Return and outside air dampers, outside air filter, fully modulating electric control system with enthalpy control, and adjustable mixed-air thermostat. System shall have 100 percent outside air capability. Provide automatic changeover through adjustable enthalpy control device.

L. Variable air volume control: Discharge air step controller, and electric control system with enthalpy control.

M. Accessories: Units shall include the following accessories as indicated or scheduled:
   1. Low ambient control: head pressure control, designed to operate at temperatures down to 0 DegF (-18 DegC).
   2. Thermostat: Assembly shall provide for staged heating and cooling with manual or automatic changeover on standard subbase.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which rooftop units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
3.2 INSTALLATION

A. General: Install rooftop units in accordance with manufacturer’s installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer’s recommended clearances.

B. Support: Installation of roof curbs shall be by the Division 7 Contractor.

C. Electrical Connections: Refer to Division 26 for final electrical connections to equipment and installation of loose shipped electrical components.

3.3 DEMONSTRATION

A. Start-Up Services:
   1. Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer’s written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

B. Operating and Maintenance Training:
   1. Provide services of manufacturer’s service representative to instruct Owner’s personnel in operation and maintenance of rooftop units. Training shall include start-up and shut-down, servicing, and preventative maintenance schedule and procedures, and troubleshooting procedures plus procedures for obtaining repair parts and technical assistance. Review operating and maintenance data contained in the Operating and Maintenance Manuals.
      a. Schedule training with Owner, provide at least a 7-day prior notice to the Engineer.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for recessed ceiling or surface wall mounting.

1.2 SUBMITTALS
A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
B. Field quality-control test reports.
C. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.
D. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE
A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.
B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

1.4 COORDINATION
A. Coordinate size, location, and connection details with roof supports, equipment supports, and roof penetrations.

1.5 WARRANTY
A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 5 years from date of Substantial Completion.
PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Carrier Air Conditioning; Div. of Carrier Corporation.
   2. Comfort Air.
   3. Mitsubishi Electronics America, Inc.; HVAC Division.

2.2 WALL SURFACE EVAPORATOR-FAN COMPONENTS

A. Chassis: High-strength molded plastic, removable panels for servicing.
   1. Drain Pans: Polycarbonate plastic, with connection for drain; insulated.

B. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins, complying with ARI 210/240, and with thermal-expansion valve.

C. Fan: Direct drive centrifugal; double inlet, forward curve.
   1. Special Motor Features: Multi-tapped, multi-speed with internal thermal protection and permanent lubrication.

D. Permanent, Cleanable Filters: 1/2-inch (25-mm) thick plastic screen.

E. Wiring Terminations: Connect motor to chassis wiring with plug connection.

F. Condensate Pump: Integral with unit.

2.3 AIR-COOLED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Galvanized steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
   1. Compressor Type: Scroll.
   2. Inverter controlled compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
   3. Refrigerant: R-410A.

C. Refrigerant Coil: Copper tube with mechanically bonded aluminum fins complying with ARI 210/240, and with liquid sub-cooler.

D. Fan: Polycarbonate plastic-propeller type directly connected to motor.

E. Motor: Permanently lubricated with integral thermal-overload protection.
2.4 ACCESSORIES

A. Low ambient operation control kit: Permits operation down to 0 DegF.

B. Roof equipment rails (for condensing unit) galvanized steel, 12 inches tall with built-in cant strip and encased wooden mounting strip. Reuse of existing equipment rails is acceptable.

C. Provide integral condensate pump powered by the unit.

D. Sensor: Hard wired, 12 VDC functioning to remotely control compressor and evaporator fan with the following features:
   1. Compressor time delay.
   2. 24-hour time control of system stop and start.
   3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
   4. Fan-speed selection, including auto setting.

E. Automatic-reset timer to prevent rapid cycling of compressor.

F. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction and liquid line with flared fittings at both ends.
   1. Minimum Insulation Thickness: 1/2 inch (13 mm).

G. Control adapter to allow unit to enable/disable through the Building Automation System.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install roof-mounting, compressor-condenser components on equipment supports. Anchor units to supports with removable, cadmium-plated fasteners.

D. Install and connect pre-charged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

E. Connect condensate drain tubing from integral condensate pump discharge to termination point indicated.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.
3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION
PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of terminal unit work is indicated by drawings and schedules, and by requirements of this section.

B. Types of terminal units required for project include the following:
   1. Unit heaters.

C. Refer to other Sections for piping; ductwork; and testing, adjusting and balancing of terminal units; not work of this section.

D. Refer to other Sections for the following work; not work of this section.
   1. Power supply wiring from power source to power connection on terminal unit. Include starters, disconnects, and required electrical devices, except where specified as furnished or factory-installed by manufacturer.
   2. Interlock wiring between electrically-operated terminal units; and between terminal units and field-installed control devices.
      a. Interlock wiring specified as factory-installed is work of this section.

E. Provide the following electrical work as work of this section. Complying with requirements of other Sections:
   1. Control wiring, specified in other Sections, between field-installed controls, indicating devices, and terminal unit control panels.

1.2 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firms regularly engaged in manufacture of terminal units, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

B. Codes and Standards:
   1. UL Compliance: Provide electrical components for terminal units which have been listed and labeled by UL.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer’s specifications for terminal units showing dimensions, capacities, ratings, performance characteristics, gauges and finishes of materials, and installation instruction.

B. Wiring Diagrams: Submit manufacturer’s electrical requirements for power supply wiring to terminal units. Submit manufacturer’s ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

C. Maintenance Data: Submit maintenance instructions, including lubrication instructions, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals; in accordance with requirements of Division 1.
1.4 DELIVERY, STORAGE, AND HANDLING

A. Handle terminal units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged terminal units or components; replace with new.

B. Store terminal units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.

C. Comply with Manufacturer’s rigging and installation instructions for unloading terminal units, and moving them to final location.

PART 2 – PRODUCTS

2.1 UNIT HEATERS

A. General: Provide unit heaters in locations as indicated and of capacities, style, and having accessories as scheduled.

B. Horizontal Unit Heaters:
   1. Casings: Construct of steel, phosphatized inside and out, and finished with baked enamel. Design casing to enclose fan, motor, and coil, design fan orifice formed into discharge panel. Provide air diffusers as scheduled.
   2. Fans: Construct of aluminum and factory-balance. Design so motor and fan assembly is removable through fan outlet panel.

C. Coils: Construct of plate-type aluminum fins, mechanically bonded to copper tubes.

D. Motors: Provide totally enclosed motors, with built-in overload protection, having electrical characteristics as scheduled.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering unit heaters which may be incorporated in the work include, but are not limited to, the following:
   2. Buffalo Forge Co.
   3. Dunham-Bush, Inc.
   4. McQuay Inc.
   6. Trane (The) Co.
   8. Young Radiator Co.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which terminal units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
3.2 INSTALLATION OF UNIT HEATERS

A. General: Install unit heaters as indicated, and in accordance with manufacturer’s installation instructions.
B. Uncrate units and inspect for damage. Verify that nameplate data corresponds with unit designation.
C. Hang units from building substrate, not from piping. Mount as high as possible to maintain greatest headroom possible unless otherwise indicated.
D. Support units with rod-type hangers anchored to building substrate.
E. Protect units with protective covers during balance of construction.

3.3 ELECTRICAL WIRING

A. General: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer’s wiring diagram submittal to Electrical Installer.
   1. Verify that electrical wiring installation is in accordance with manufacturer’s submittal and installation requirements of other Sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

3.4 ADJUSTING AND CLEANING

A. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
B. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
C. Install new filter units for terminals requiring same.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Provide electrical demolition work as indicated and as required for removal and/or abandonment of systems, equipment, devices, etc., made obsolete by this Project and as required for demolition and remodeling by the other trades.

1.2 EXISTING CONDITIONS

A. General: In general, existing electrical systems, equipment, and devices are not shown on the Drawings unless pertinent to the demolition and/or remodeling work. Existing electrical conditions, where indicated, are based on casual field observations and must be verified. Report any discrepancies to the Engineer before disturbing the existing installation.

B. Examination: Prior to bidding, examine the site to determine all actual observable conditions. No additional compensation will be granted on account of extra work made necessary by the Contractor’s failure to investigate such existing conditions.

1.3 COORDINATION

A. Adjoining Areas: It is expected that the Contractor understands that adjoining areas of the building (or project site) must remain in operation and electrical systems and services must remain in operation at all times, unless specifically approved otherwise.

B. Scheduling: Electrical demolition work shall be scheduled in conjunction with the other trades. Contractor cooperation will be expected under all conditions.

C. Area Limits: Construction traffic and removal of debris will be limited to specific areas and routes. Confirm with the Owner.

1.4 ADJACENT MATERIALS

A. Protection: During execution of demolition work, primary consideration shall be given to protecting from damage, building structure, furnishings, finishes, and the like, which are not specifically indicated to be removed.

B. Repairs: Existing items or surfaces to remain, which are damaged as a result of this work shall be refinished, repaired or replaced to the satisfaction of the Owner, at no cost to the Contract.

1.5 TRANSIENT SERVICES

A. Locate and identify any and all electrical services passing through the project area which serve areas outside the work limits.

B. Maintain all electrical services to areas outside the work limits unless specifically authorized otherwise in writing by the Engineer or Owner. When transient services must be interrupted, provide temporary services for affected areas outside the work limits.
PART 2 – PRODUCTS

2.1 MATERIALS

A. Patching: Materials used for patching shall be in conformance with the applicable sections of the Project Manual. Where materials are not specifically described, but required for proper completion of the Work, they shall be as selected by the Contractor subject to approval of the Engineer.

PART 3 – EXECUTION

3.1 INSPECTION/VERIFICATION

A. Inspection: Before commencing work of this Section, carefully inspect the project site and become familiar with existing systems and conditions.

B. Items to be Salvaged: Verify with the Engineer and Owner, all systems, materials and equipment which are to be salvaged, and those which must be removed. The Owner reserves the right to salvage any or all existing electrical materials and equipment at the project site.

3.2 COORDINATION

A. Coordinate all demolition work with all other trades, and utility companies where applicable.

3.3 DEMOLITION

A. General: Remove existing electrical equipment, devices, raceways, wiring and related materials within the project work limits, as indicated.

B. Disconnections: Disconnect all electrical devices and equipment located in walls, ceilings or floors scheduled for removal and other equipment as indicated. Disconnect electrical connections to mechanical and other equipment being removed by other trades.

C. Wiring Removals: Where existing electrical devices or equipment are indicated or required to be removed, remove all associated wiring. Remove all abandoned or dead wiring back to source.

D. Raceway Removals: Remove all abandoned raceways, boxes, supports, etc. where exposed (including those located above existing or new suspended ceilings), and where they interfere with new work of any trade. Cut conduits flush with walls and floors, and cap.

E. Protection: Perform all demolition work in such a manner so that damage to adjacent items and surfaces is minimized.

F. Patching: When electrical materials are removed, patch and finish walls, surfaces, etc. to match surrounding surfaces. Provide blank coverplates as required, etc.

3.4 EXISTING ELECTRICAL WORK TO REMAIN

A. General: Protect and maintain access to existing electrical work which must remain. Reinstall existing electrical work disturbed.

B. Reconnections: Where electrical work in adjoining areas, or electrical work indicated to remain, becomes disconnected or affected by demolition work, reconnect circuits, etc. as required to restore original operation. Restoration work to comply with requirements for new work.
3.5 EXISTING ELECTRICAL WORK TO BE RELOCATED

A. General: Disconnect, remove, reinstall and reconnect existing devices and equipment indicated to be relocated and where required to accommodate remodeling or new construction. Extend existing installations as required. Materials and methods used for relocations and extensions to conform to requirements for new work and to be provided as required.

3.6 DISPOSITION OF EXISTING MATERIALS AND EQUIPMENT

A. Items to Salvage: Material and equipment which is indicated (or directed by the Owner) to be salvaged, shall be carefully removed and stored where directed on the site.

B. Items to Reuse/Relocate: Carefully remove and store on site, all material and equipment indicated to be reused or relocated. Thoroughly clean, and make any necessary minor repairs to such equipment, prior to reinstallation.

C. Items to Remove: Remove and legally dispose of all other materials and debris resulting from demolition work, on a daily basis.

3.7 CLEANING

A. Remove from the Project Site all dirt, dust and debris resulting from demolition operations on a daily basis. Refuse shall not be allowed to block or otherwise impair circulation in corridors, stairs, sidewalks, roadways or other traffic areas.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Basic administrative, procedural, and general requirements for electrical products and installation applicable to all Division 26 work.

1.2 RELATED DOCUMENTS

A. Bidding Requirements, Contract Forms, and Conditions of the Contract (General and Supplementary Conditions) apply to all work of Division 26.

B. Comply with Division 1 - General Requirements.

C. All work under this Division shall be in accordance with the Contract Documents as defined in the General Conditions.

1.3 SCOPE OF WORK

A. Provide all labor, materials, tools, equipment, transportation, and services necessary for and incidental to completion of all electrical work as indicated on the Drawings and/or as specified herein.

A. DRAWING USE AND INTERPRETATION. Provide all items and work indicated on the Contract Documents. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete and workable heating, ventilating, air conditioning, electrical and plumbing systems. Perform start-up and testing of each item and system to provide fully operable systems.

B. Neither the specifications nor the drawings undertake to illustrate or describe all items necessary for the work; it is expected that the Electrical contractor shall be familiar with all applicable codes and shall provide an electrical installation in conformance with all applicable codes.

C. If, in the interpretation of contract documents, it appears that the drawings and specifications are not in agreement, the one requiring the greater quantity or superior quality shall prevail, as decided by the Engineer. Addenda supersede the provisions which they amend.

D. After review of the drawings and specifications, the EC shall be completely familiar with the function of all items included and that his bid shall reflect the inclusion of all hangers, racks, inserts, etc., necessary for a complete and operable system. The EC shall provide offsets, fittings and accessories as may be required to meet such field conditions. The EC shall make all changes in equipment, locations, etc., to accommodate the work and to avoid obstacles at no increase in remuneration.

E. Items of work shown on the contract documents shall be furnished and installed as appearing on both drawings and specifications.

F. Equipment, conduit, etc., shall be installed to avoid interferences with the operation, servicing and maintenance of equipment.
G. Certain materials and equipment shall be provided by other trades. The EC shall examine the Contract Documents to ascertain these requirements. Unless specifically indicated as being supplied or installed by others, all items of work shown on the drawings or indicated in the specifications shall be included by the EC in his bid.

H. All dimensions which relate to the building shall be taken as construction progresses. All errors incurred as a result of the EC’s failure to check or verify dimensions, measurements, etc., shall be corrected at the EC’s expense.

I. The EC shall review the contract documents for the work of other trades, informing the Architect of any conditions which obstruct, interfere with, or in any way prevent him from completing his work in a first class manner.

1.4 COMPLETE SYSTEMS

A. General: Furnish and install all materials as required for complete systems including all parts obviously or reasonably incidental to a complete installation, whether specifically indicated or not. All systems shall be completely assembled, tested, adjusted, and demonstrated to be ready for operation prior to Owner’s acceptance.

B. Wiring: The wiring specified and/or shown on the Drawings is for complete and workable systems. Any deviations from the wiring shown due to a particular manufacturer’s or subcontractor’s requirements shall be made at no cost to either the Contract or the Owner.

1.5 CODES AND REGULATIONS

A. General: Comply with the National Electrical Code (NEC) and all governing federal, state, and local laws, ordinances, codes, rules, and regulations. Where the Contract Documents exceed these requirements, the Contract Documents shall govern. In no case shall work be installed contrary to or below minimum legal standards.

B. Utilities: Comply with all applicable rules, restrictions, and requirements of the utility companies serving the project site/facilities.

C. Non-Compliance: Should any work be performed which is found not to comply with any of the above codes and regulations, provide all work and pay all costs necessary to correct the deficiencies.

1.6 REFERENCE STANDARDS

A. All latest recognized published standards of the following associations/organizations shall be followed and applied where applicable, as minimum requirements:

1. (ADA), Americans with Disabilities Act.
2. (ANSI), American National Standards Institute.
4. (BOCA), Building Officials and Code Administrators International, Inc.
5. (ETL), Electrical Testing Laboratory.
7. (ICEA), Insulated Cable Engineers Association.
8. (IEEE), Institute of Electrical and Electronic Engineers.
10. (NBFU), National Board of Fire Underwriters.
11. (NEMA), National Electrical Manufacturers Association.
14. (UL), Underwriter’s Laboratories.
15. Maine Uniform Building Code

1.7 PERMITS

A. General: Obtain and pay for any and all permits required by all applicable agencies prior to commencing work.

1.8 QUALITY ASSURANCE

A. Manufacturers’ Qualifications: Not less than three (3) years of experience in the actual production of the specified products.

B. Installers’ Qualifications: Firm with not less than five (5) years of experience in the installation of electrical systems and equipment similar in scope and complexity to those required for this Project, and having successfully completed at least ten comparable scale projects.

C. Incidental Work: Painting, patching, welding, carpentry, and the like related to or required for Division 26 work shall be performed by craftsman skilled in the appropriate trade but shall be provided for under Division 26.

1.9 SUBMITTALS

A. General: Prepare and submit for approval, per the procedures set forth in Division 1, all submittals required by Division 1, this section, and by all other Contract Documents.

B. Types: Required submittals may include: Schedule of Values; List of Subcontractors; Product Data; Shop Drawings; Samples; Test Reports; Certifications; Warranties; Maintenance Manuals; Record Drawings; and various administrative submittals.

C. Number of Copies: As indicated in Division 1, Division 26, or elsewhere in the Contract Documents. For quantities indicated in the Contract Documents or specification sections other than Division 26 sections, increase number of copies by one to allow for the Engineer’s record copy. Minimum number of copies per submittal: Three (3).

D. Product Data: Submit for equipment, devices, and materials as required in subsequent individual Division 26 sections. Product data to consist of manufacturer’s standard catalog cuts, descriptive literature, and/or diagrams in 8-1/2-inch-by-11-inch format and in sufficient detail so as to clearly indicate compliance with all specified requirements and standards. Mark each copy to clearly indicate proposed product, options, finishes, etc.

E. Shop Drawings: Submit for equipment and systems as required in subsequent individual Division 26 sections. Shop Drawing to be newly prepared, specifically for this project, and shall include all information listed in the Shop Drawings submittal requirements in the respective specification section. Include all pertinent information such as equipment/system identification, manufacturer, dimensions, nameplate data, sizes, capacities, types, materials, performance data, features, accessories, wiring diagrams, etc., in sufficient detail so as to clearly indicate compliance with all specified requirements and standards.
F. Maintenance Manuals: Include operating and maintenance data in accordance with Division 1 for each Division 26 section requiring a Product Data and/or Shop Drawing submittal. Include the respective Product Data/Shop Drawing submittals as well as descriptions of function, normal operating characteristics and limitations, and manufacturer’s printed operating, maintenance, trouble shooting, repair, adjustment, and emergency instructions, and complete replacement parts listing.

G. Record Documents: Prepare and submit in accordance with Division 1. In addition to Division 1 requirements, indicate actual installed locations for all equipment and devices, routing of major interior raceways, locations of all concealed and underground equipment and raceways, and all approved modifications to the Contract Documents, and deviations necessitated by field conditions and change orders.

1.10 INSPECTIONS

A. General: During and upon completion of the work, arrange and pay all associated costs for inspections of all electrical work installed under this contract, in accordance with the Conditions of the Contract.

B. Inspections Required: As per the laws and regulations of the local and/or state agencies having jurisdiction at the project site.

C. Inspection Agency: Approved by the local and/or state agencies having jurisdiction at the project site.

D. Certificates: Submit all required inspection certificates.

1.11 ABBREVIATIONS AND DEFINITIONS

A. Abbreviations:

EC: The Contractor performing the electrical work.
MC: The Contractor performing the heating, ventilating, air conditioning, and mechanical work.
PC: The Contractor performing the plumbing work.
SC: The Contractor performing the sprinkler system work.
GC: The Contractor performing the general building work.
CM: The Construction Manager.

References to the above designations are not intended to define contracts and/or subcontracts but only as reference to where items are shown on drawings or described in specifications.

B. Definitions:

Concealed: Embedded in masonry or other construction, installed behind wall furring, within partitions or hung ceilings (permanent or removable), in trenches, or in crawl spaces.

Exposed: Not installed underground or concealed.

Noted: As indicated on the drawings and/or specified.
Indicated or Shown: As indicated or shown on the drawings.

Wiring: Conduits, fittings, wire, junction and outlet boxes, switches, cutouts, and receptacles and items necessary or required in connection with or relating thereto.

Provide: Furnish and install

PART 2 – PRODUCTS

2.1 GENERAL

A. Where Specified: Materials and equipment shall be as specified in subsequent sections of the Project Manual and/or as indicated on the Drawings.

B. General Requirements: All materials and equipment shall be in accordance with the Contract Documents, and to the extent possible, standard products of the various manufacturers, except where special construction or performance features are called for. All materials and equipment to be new, clean, undamaged, and free of defects and corrosion.

C. Acceptable Products: The product of a specified or approved manufacturer will be acceptable only when that product complies with or is modified as necessary to comply with all requirements of the Contract Documents.

D. Common Items: Where more than one of any specific item is required, all shall be of the same type and manufacturer.

E. UL Listing: All electrical materials and equipment shall be Underwriters’ Laboratories (UL) listed and labeled, where UL standards and listings exist for such materials or equipment.

2.2 PRODUCT OPTIONS AND SUBSTITUTIONS

A. Refer to the Conditions of the Contract, and Division 1.

PART 3 – EXECUTION

3.1 GENERAL

A. The installation of all electrical work shall be in accordance with the letter and intent of the Contract Documents, as determined by the Engineer.

B. Installation Requirements: All materials and equipment shall be installed as recommended by the respective manufacturers, by mechanics experienced and skilled in their particular trade, in a neat and workmanlike manner, in accordance with the standards of the trade, and so as not to void any warranty or UL listing.

C. Administration and Supervision: All electrical work shall be performed under the Contractor’s direct supervision, using sufficient and qualified personnel as necessary to complete the work in accordance with the progress schedule. The Contractor shall assign one or more competent supervisors who shall have authority to accept and execute orders and instructions, and who shall cooperate with the other Contractors and subcontractors, the Engineer and Owner in all matters to resolve conflicts and avoid delays.
3.2 DELIVERY STORAGE AND HANDLING

A. Comply with Division 1 requirements.

B. Packing and Shipping: Deliver products in original, unopened packaging, properly identified with manufacturer’s identification, and compliance labels.

C. Storage and Protection: Comply with all manufacturer’s written recommendations. Store all products in a manner which shall protect them from damage, weather, and entry of debris.

D. Damaged Products: Do not install damaged products. Arrange for prompt replacement.

3.3 EXAMINATION

A. Conditions Verification: Examine the areas and conditions under which the work is to be performed and identify any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.4 COORDINATION

A. General: Sequence, coordinate, and integrate the installation of all electrical materials and equipment for efficient flow of work, in conjunction with the other trades. Review the Drawings for work of the other trades, and report and resolve any discovered discrepancies, prior to commencing work.

B. Cooperation: Cooperate with the other Contractors and individual disciplines for placement, anchorage and accomplishment of the work. Resolve interferences between work of other disciplines or Contractors, prior to commencing installation.

C. Chases, Slots, and Openings: Arrange for chases, slots, and openings during the progress of construction, as required to allow for installation of the electrical work.

D. Supports and Sleeves: Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

E. Obstacles and Interferences: When installing equipment and raceways, provide offsets, fittings, accessories, and changes in elevation or location as necessary to avoid obstacles and interferences, per actual field conditions.

3.5 DIMENSIONS

A. Building Dimensions: For exact locations of building elements, refer to dimensioned drawings. However, field measurements take precedence over dimensioned drawings.

B. Limiting Dimensions: Equipment outlines shown on detail drawings of 1/4” = 1'-0” scale or larger and dimensions indicated on the Drawings are limiting dimensions. Do not install equipment exceeding dimensions indicated by outlines on Drawings, or equipment or arrangements that reduce indicated clearances.

3.6 EQUIPMENT PROTECTION

A. Protect all electrical equipment, and materials and work from the weather elements, paint, mortar, construction debris and damage, until project is substantially complete. Repair, replace, clean all electrical work so affected.
3.7 CHECKOUT, TESTING, AND ADJUSTING

A. General: Schedule and provide testing equipment, materials, instruments, and personnel as necessary to checkout and to perform all test procedures and adjustments required by the Contract Documents and/or deemed necessary by the Engineer to establish proper performance and installation of electrical systems and equipment. All test instruments to be accurately calibrated and in good working order.

B. Scheduling: Schedule tests at least three days in advance, and so as to allow Engineer and Owner representative(s) to witness the test, unless directed otherwise. Do not schedule tests until the system installation is complete and fully operational, unless indicated or directed otherwise.

C. Manufacturer’s Authorized Representatives: When required by subsequent Division 26 specification sections, arrange and pay for the services of the manufacturer’s authorized representative(s) to be present at time of equipment or system start-up, to supervise the start-up, and to conduct and/or certify all required testing and adjusting.

D. Test Reports: Submit test reports neatly typewritten on 8-1/2-inch-by-11-inch sheets indicating system or equipment being tested, methodology of testing, date, and time of test, witnesses of test, and test results. Submit test reports in three (3) copies to the Engineer for review within five (5) days after test is performed and include a copy with the appropriate operation and maintenance data.

E. Correction/Replacement: After testing, correct any deficiencies, and replace materials and equipment shown to be defective or unable to perform at design or rated capacity. Retest without additional cost to the Owner or Contract. Submit finalization report indicating corrective measures taken, and satisfactory results of retest.

3.8 SYSTEMS DEMONSTRATION

A. Instruct the Owner’s representative(s) in the start-up, operation, and maintenance of all electrical systems and equipment in accordance with Division 1 as required by subsequent sections and as requested by the Owner’s Representative.

3.9 CLEANING AND TOUCH-UP PAINTING

A. Perform cleaning required by Division 1.

B. General: Periodically remove from the project site, all waste, rubbish and construction debris accumulated from construction operations, and maintain order. The premises shall be left clean and free of any debris and unused construction materials, prior to final acceptance.

C. Electrical Equipment: Remove all dust, dirt, debris, mortar, wire scraps, rust, and other foreign materials from the interior and exterior of all electrical equipment and enclosures and wipe down. Clean accessible current carrying elements and insulators prior to energizing.

D. Light Fixtures: Thoroughly clean all light fixtures and lamps, just prior to final inspection. Fixture enclosures, reflectors, lenses, etc. shall be cleaned free of dust, dirt, fingerprints, etc. by an approved method.
E. Touch-Up Painting: Restore and refinish to original condition, all surfaces of electrical equipment scratched, marred and/or dented during shipping, handling, or installation. Remove all rust, and prime and paint as recommended by the manufacturer.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: General requirements, and basic electrical materials and methods applicable to all Division 26 work. Limited scope general construction materials and methods for application with electrical installations are also included.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s descriptive literature for each type of firestopping material to be used on the project.

1.3 COORDINATION

A. Chases, slots, inserts, sleeves, and openings: Coordinate with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

PART 2 – PRODUCTS

2.1 PIPE SLEEVES

A. Rigid steel conduit or iron pipe.

2.2 CONDUIT SEALS

A. For Cast-in-Place Concrete Applications:

1. Acceptable Manufacturers:
   a. O-Z/Gedney Type "FSK."
   b. Thunderline Corp. "Link Seal" with "Link Seal Wall Sleeve."

B. For Core Drilled and Pre-cast Opening Applications:

1. Acceptable Manufacturers:
   a. O-Z/Gedney Type "CSML."
   b. Thunderline Corp. "Link Seal."

2.3 FIRESTOPPING MATERIALS

A. General: Firestop systems composed of firestop compounds and appropriate damming materials installed together with the penetrant (e.g., conduit) to form a complete firestop system, providing a fire-resistant rating at least equal to the hourly fire-resistance rating of the floor, wall, or partition into which the firestop system is to be installed.
B. Test Standards: Firestopping materials shall be tested together as a system to the time/temperature requirements of ASTM E119 and shall be tested to UL 1479 (ASTM E814) and be UL classified for up to 3 hours.

C. Firestop Sealants: Non-hardening, conformable, intumescent putties, sealants or other compounds, containing no toxic solvents or asbestos, and exhibiting aggressive adhesion to all common building materials and penetrants, while allowing reasonable movement of the penetrants, without being displaced. Compounds shall be waterproof, non-toxic, and smoke and gas tight.

D. Firestop Mortars: Light-weight, water-based, cementitious, fast drying, low density mortar, non-shrinking and non-cracking during its cure, and which forms a surface capable of being sanded, bored and painted.

E. Damming Materials: Mineral wool or ceramic fiber.

F. Multi-Cable Transits: Assemblies consisting of a frame, a compression mechanism, and grooved insert sealing modules sized for multiple penetrating elements of various sizes.

G. Acceptable Manufacturers:
   1. Dow Corning.
   2. Heavy Duty/Nelson.
   4. Specified Technologies, Inc.
   5. Hilti.

2.4 SOIL MATERIALS

A. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, or natural or crushed sand.

B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100 percent passing a 1-1/2-inch sieve and not more than 5 percent passing a No. 4 sieve.

C. Backfill and Fill Materials: Materials complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP, free of clay, rock, or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetable, and other deleterious matter.

2.5 TOUCH UP PAINT

A. For Equipment: Equipment manufacturer’s paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 – EXECUTION

3.1 ELECTRICAL INSTALLATION – GENERAL

A. Unfinished and Finished Areas: For the purposes of these electrical specifications, "unfinished" areas shall include mechanical, electrical, and telephone equipment rooms. All other areas shall be considered "finished" spaces unless indicated or approved otherwise.
B. In Unfinished Areas: Raceways, equipment, and devices may be installed, concealed or exposed, unless indicated otherwise.

C. In Finished Areas: Conceal all raceway and flush mount all electrical boxes, equipment, and devices unless indicated or approved otherwise. The space above suspended ceilings or behind furred spaces is considered outside finished areas and electrical materials installed within these areas are considered concealed.

D. Headroom: Arrange and install components and equipment to provide the maximum possible headroom, unless otherwise indicated.

E. Dimensions and Clearances: Field measure all dimensions and clearances affecting the installation of electrical work, in relation to established datum, building openings and clearances, and work of other trades, as construction progresses.

F. Rough-In Locations: Verify final locations for rough-ins with field measurements and requirements of actual equipment being installed.

G. Door Swings: Verify the swings of all doors before switch outlets or other electrical devices are installed. If necessary, relocate devices so they are not obstructed by doors when doors are open.

H. Ceiling Mounted Devices: The locations indicated on the architectural reflected ceiling plans take precedence over the electrical documents, in the event of conflict.

3.2 LAYOUT

A. General: Install electrical systems, materials and equipment level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

B. Serviceability: Install electrical equipment and raceways, etc., to readily facilitate servicing, maintenance and repair or replacement of components, and so as to minimize interference with other equipment and installations.

C. Clearances: Prior to commencing work, verify that all electrical equipment will adequately fit and conform to the indicated and code required clearances, in the spaces indicated on the Drawings. If rearrangement is required, submit plan and elevation drawings or sketches indicating proposed rearrangement, for the Engineer’s approval. Do not rearrange without express written permission of the Engineer.

D. Right-Of-Way: When laying out electrical work, give priority in available space to steam and condensate lines, sanitary lines, drain lines, fire protection piping and sheet metal duct work. Provide offsets as required to avoid conflicts. Resolve all conflicts before commencing installation.

3.3 MOUNTING HEIGHTS

A. General: Indicated heights are measured from the center of the device outlet box to finished floor or grade, unless indicated otherwise. Request instructions for mounting heights not indicated.

B. Architectural Elevations: Heights and locations for outlets and equipment in specific areas when indicated on architectural elevations take precedence over mounting heights and locations indicated in electrical documents. If outlets and equipment are not indicated on the architectural elevations, the electrical documents govern.
C. Adjustments: Adjust mounting heights in exposed masonry construction so that bottoms of outlet boxes are along the edges of blocks, unless indicated otherwise.

3.4 HOLES, SLEEVES, AND OPENINGS

A. General: Provide all holes, sleeves, and openings required for the completion of Division 26 work and restore all surfaces damaged, to match surrounding surfaces. Maintain integrity of all fire and smoke rated barriers using approved firestopping systems. When cutting holes or openings, or installing sleeves, do not cut, damage or disturb structural elements or reinforcing steel, unless approved, in writing, by the Project Structural Engineer.

B. Conduit Penetrations: Size core drilled holes so that an annular space of not less than 1/4 inch and not more than 1 inch is left around the conduit. When openings are cut in lieu of core drilled, provide sleeve in rough opening. Size sleeves to provide annular space of not less than 1/4 inch and not more than 1 inch around the conduit. Patch around sleeve to match surrounding surfaces.

3.5 CONDUIT SEALS

A. Install conduit seal for each conduit penetrating an exterior building wall below grade (unless penetration is below lowest building floor slab), and elsewhere as indicated, and so as to achieve a sealed watertight installation.

B. Install conduit seal for each conduit passing from a heated building to a non-heated building and vice versa.

C. Install conduit seal for each conduit passing from a hazardous location to a non-hazardous location and vice versa.

3.6 FIRESTOPPING SYSTEMS

A. General: Install firestopping at all electrical raceway and cable penetrations through floor structures and interior walls or partitions which are time-rated fire and/or smoke barriers.

B. Preparation: Prior to installation, verify that all penetrating elements and supporting devices are permanently installed and that surfaces which will be in contact with penetration seal materials are clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.

C. Installation: Install firestop systems in accordance with UL approved design details and the manufacturer’s instructions. Install sleeves, conduits, and cables with required clearance spaces, allowing installation of sealing materials. Do not exceed the outside diameter of the sleeve, conduit or cable by more than 1 inch or by less than 1/4 inch when making openings for penetrations. Install firestop systems so as to completely seal openings to prevent passage of smoke and water.

3.7 CUTTING AND PATCHING

A. General: Provide all cutting, drilling, chasing, fitting and patching necessary for accomplishing the work of Division 26. This includes any and all work necessary to: uncover work to provide for the installation of ill-timed work; remove and replace defective work and work not conforming to the requirements of the Contract Documents; install equipment and materials in existing structures; in addition to that required during the normal course of construction.

B. Comply with the cutting and patching requirements of Division 1.
C. Building Structure: Do not endanger the integrity of the building structure by cutting, drilling or otherwise modifying any structural member, without specific approval. Do not proceed with any structural modifications without written permission of the Project Structural Engineer.

D. Repairs: Repair any and all damage to work of other trades caused by cutting and patching operations, using skilled mechanics of the trades involved.

3.8 UNDERGROUND ELECTRICAL WORK

A. General: Perform all excavating, trenching and backfilling, etc., as indicated or required for the installation of all underground electrical work. Coordinate work with other trades and verify existing underground services and conditions.

B. Conduit Burial Depth: 30 inches below finished grade unless indicated otherwise. All excavation and burial depths indicated are below finished grade.

C. Excavating: Do not excavate below required depth, except as necessary for removal of unstable soil or when rock is encountered. When rock is encountered, excavate 6 inches below the required depth and backfill with a minimum 6-inch layer of crushed stone or gravel between rock bearing surface and the electrical installation. Stockpile satisfactory excavated materials where directed, until required for backfilling. Remove and legally dispose of excess excavated materials and materials not suitable for backfill use. Shore and brace as required for stability of excavation. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting off at an elevation of 30 inches below finished grade.

D. Protection: Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by excavations.

E. Existing Utilities: Remove existing electrical and other utility lines so indicated. Where existing utilities which are to remain exist within areas of excavation, locate such utilities and support and protect during excavation operations.

F. Trenching: Cut all trenches neatly and uniformly and so as to provide ample working room and at least 6 inches clearance on both sides of raceways, etc. Take necessary precautions when working near existing underground utilities, and coordinate with the installation of concurrent utilities by other trades. Unless indicated otherwise, pitch all electrical conduit runs downward away from buildings, manholes, and pad mounted equipment. Excavate trenches to depth indicated or required. Limit length of open trench to that in which installations can be made and trenches backfilled within the same day.

G. Sand Envelope: Install a minimum envelope of 3 inches (top, bottom, and sides: 3 inches each) of fine grain sand around all electrical cables and conduits installed below grade unless indicated otherwise.

H. Preparation for Backfilling: Backfill excavations as promptly as work permits, but not until completion of inspection, testing, approvals, and recording of underground utility locations. Prior to backfilling, remove all concrete form work, shoring, bracing, trash and debris.

I. Backfilling: Use only approved materials free from boulders, sharp objects and other unsuitable materials. Match the final elevations and materials of areas affected by electrical excavating, trenching and backfilling. Replace conduit and cables damaged by improper backfilling. Replace surface materials to match existing surface materials if no other utility or site work is being done in area. Place specified soil materials in 4- to 8-inch layers to required subgrade elevations, for area classifications as follows:
1. Under Sidewalks and Pavements: Use combination of subbase materials and excavated or borrowed materials.


3. Under Piping and Equipment: Use subbase materials where required over rock bearing surfaces and for correction of unauthorized excavation.

4. For Raceways less than 30 Inches below Surface of Roadways: Provide 4-inch thick concrete base slab support. After raceway installation, provide 4-inch thick concrete encasement (sides and top) prior to backfilling and placement of roadway subbase.

J. Backfill Placement: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.

K. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.

L. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D1557 and not less than the following percentages of relative density, determined in accordance with ASTM D2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

1. Areas under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive materials and 95 percent relative density for cohesionless materials.

2. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive materials, and 95 percent relative density for cohesionless materials.

3. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive materials, and 90 percent relative density for cohesionless materials.

M. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

N. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.9 REFINISHING AND TOUCH UP PAINTING

A. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

B. Repair damage to paint finishes with matching touch-up coating recommended by manufacturer.
3.10 CLEANING AND PROTECTION

A. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Provide wire, cable, and connectors as indicated or required for all feeders, branch circuits, control circuits, etc.

1.2 SUBMITTALS

A. Product Data: Manufacturer’s descriptive literature for each wire and connector type to be used on the project.

PART 2 – PRODUCTS

2.1 GENERAL

A. All wiring systems to consist of individual conductors installed in conduit or other raceway, unless specifically indicated otherwise.

2.2 600-VOLT CLASS WIRE

A. General: All wire and cable shall be constructed in accordance with all applicable ICEA, NEMA and IEEE published standards, and shall be UL-listed and labeled.

B. Single-conductor, 98 percent conductivity, annealed uncoated copper conductor with 600-volt rated insulation.

C. No. 10 AWG and Smaller: Solid or stranded, 90 DegC with Type Dual rated THHN/THWN insulation.

D. No. 8 AWG and Larger: Class B stranded, 90 DegC with Type Dual rated THHN/THWN insulation.

E. Do not use aluminum or copper-clad aluminum alloy conductors.

F. Acceptable Manufacturers:
   1. General Cable,
   2. Cerro Wire.
   3. Southwire,
   4. Encore Wire.

2.3 CONNECTORS

A. General: UL-listed, factory fabricated designed for the application.

B. Splicing Connectors (No. 14-10 AWG): Nylon shell insulated metallic screw-on connectors.
C. Cable Connectors (No. 8 AWG and Larger): Cable connectors for making terminations, tee-taps and splices shall be bolted pressure or compression type lugs and connectors, with molded plastic insulators.

D. Terminations (No. 10 AWG and smaller, stranded): Nylon insulated, crimp ring or fork type terminals for connection to screw terminals.

E. Acceptable Manufacturers:
   1. Amp.
   2. Burndy, Ilsco.
   3. Ideal.
   4. 3M.
   5. Thomas & Betts.

2.4 TAPES

A. Acceptable manufacturers:
   1. Plymouth.
   2. 3M Scotch Brand.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine all wire and cable prior to installation. Do not use wire and cable with bruised, cut, or abraded insulation; or wire that does not pass a continuity test.

3.2 CONDUCTOR SIZES AND QUANTITIES

A. Minimum Conductor Size: All branch circuit wiring shall be minimum No. 12 AWG. All control circuit wiring shall be minimum No. 14 AWG. Provide larger sizes as indicated or required.

B. Branch Circuit Conductor Sizes: Provide branch circuit conductor sizes as indicated on the panelboard schedules, plans, or elsewhere. Neutral conductor size to match phase conductors unless approved by Engineer.

C. Equipment Grounding Conductor Required: For each branch circuit and feeder run, provide an equipment grounding conductor for continuous length of run, sized per NEC 250.122 (minimum), larger if so indicated.

D. Separate Neutral: For branch circuit homeruns with two or three single-pole circuits (of different phases) use separate neutral conductors, unless approved by Engineer.

E. Combining Homeruns: Do not combine separately indicated homeruns in single conduit unless indicated or approved by the Engineer.

F. Switch Legs: Provide branch circuit switch legs and travelers as required for the switching indicated.

G. Feeders: Provide feeder conductor sizes and quantities as indicated.
3.3 INSTALLATION

A. General: Install all conductors and other associated items in compliance with applicable requirements of NEC, NEMA, UL and NECA’s “Standards of Installation” and in accordance with manufacturer’s recommendations.

B. In Raceway: Install all wiring in conduit or other specified raceway unless indicated otherwise.

C. Terminations: Furnish and install terminations, including lugs if necessary, to make all electrical connections indicated or required. Make connections and terminations for all stranded AWG conductors using crimp, clamp, or box type connectors and terminators. Enclose all strands of stranded conductors in connectors, and lugs.

D. Tightening: Tighten all connectors, lugs, screws, bolts, Allen-heads and other electrical fasteners to torque values per manufacturer’s written instructions.

E. Restrictions: Do not substitute smaller conductors with higher temperature rated insulations in lieu of conductor size shown on Drawings.

3.4 COLOR CODE

A. Color code all branch circuit and feeder conductors as follows:

B. 208/120 Volts:

<table>
<thead>
<tr>
<th>PHASE</th>
<th>COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Black</td>
</tr>
<tr>
<td>B</td>
<td>Red</td>
</tr>
<tr>
<td>C</td>
<td>Blue</td>
</tr>
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C. 480/277 Volts:

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<tr>
<td>B</td>
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</tr>
<tr>
<td>C</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
<td>Gray</td>
</tr>
</tbody>
</table>

D. Equipment Grounding Conductors: Green

E. Conductors No. 10 AWG and Smaller: Color impregnated.

F. Conductors No. 8 and larger may use color impregnated insulation, or conductor ends may be taped. Taping to be with solid color electrical tape, lap wound, visible without removing dead-front covers in electrical equipment with at least 3 inches visible at all terminations and electrical boxes.

3.5 PHASE ARRANGEMENT

A. Arrange phases in all electrical equipment as follows:

1. A, B, C: Front to Rear.
2. A, B, C: Top to Bottom.
3. A, B, C: Left to Right When Facing Established Front of Equipment.

3.6 HIGH TEMPERATURE WIRE

A. Provide conductors with not less than 90 DegC rated insulation when branch circuit wiring is attached to high temperature light fixtures (e.g., fluorescent & HID), boilers, incinerators, ovens, ranges, kitchen exhaust fans, other heat-producing equipment, and “100 Percent Rated” overcurrent protective devices. Use special higher temperature wire as required for connection to specialty equipment as required by equipment manufacturer.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Provide all power and control wiring for and make connections to motors and motor control equipment.

B. Motors: In general, motors are provided under Division 23.

C. Motor Control Equipment: In general, motor control equipment is provided under Divisions 21 through 23 and installed and wired under Division 26. Exceptions are as indicated on the Drawings and specified herein.

D. Motor Control Equipment: In general, motor control equipment is provided, installed, and wired under this Division. Exceptions are as indicated on the drawings and specified herein.

E. Coordinate with Divisions 21 through 23 so that:
   1. There is no duplication of services or materials provided.
   2. Motor controllers provided are specifically designed for and fully compatible with each motor supplied by Divisions 21 through 23 in every aspect.

1.2 RELATED DOCUMENTS

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

B. All Division 26 Specifications shall apply to this Section.

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1.

B. Wiring Diagrams: For each motor provide computer generated power wiring and control ladder diagrams specifically developed for this project.

1.4 QUALITY ASSURANCE


PART 2 – PRODUCTS

2.1 GENERAL

A. Equipment and materials as specified elsewhere in Division 26 or as indicated on the Drawings.
PART 3 – EXECUTION

3.1 GENERAL

A. Connections: Make all connections to motors and control equipment complete and leave equipment in proper operating order. Connect power to motors for correct rotation. Verify nameplate ratings of all motors. Report any deviations or discrepancies.

B. Coordination: Coordinate with Divisions 21 through 23 as required.

3.2 POWER WIRING

A. General: Unless indicated otherwise, provide all required power wiring from indicated power source to each disconnect, controller, and motor, as required.
   1. If wire size is not indicated, minimum size will be as indicated in NEC Article 430.

3.3 CONTROL WIRING

A. General: Automatic temperature control wiring for HVAC equipment shall be provided under Division 23. Wiring from motor controllers to remote control stations, and interlock wiring is to be provided under Division 26.

B. Coordination: Provide all control wiring as indicated on the Division 26 motor control notes, diagrams or elsewhere. Coordinate all control interfaces with Division 23.

C. Wire Size: Unless indicated otherwise use No. 14 AWG wire for all control circuits. For circuits longer than 200 feet use No. 12 AWG wire.

D. Control Circuit Power: Connect all control circuitry for motors so that when the circuit to the motor is disconnected, the control power is also disconnected. When control power is from a source other than the motor’s power source, install an auxiliary control power interlock switch integral with the motor’s or motor controller’s disconnect. If the equipment design does not allow this, install a lockable, labeled control power disconnect immediately adjacent to the motor disconnect.

E. Installation: Install all control wiring in conduit. Neatly group, tie and strap in place all control wiring, and terminate at labeled terminal strips.

3.4 ROOF-TOP EQUIPMENT

A. Install wiring to roof-top equipment (e.g., power roof ventilators) in such a way that all conduit and wiring will be covered by unit. Seal conduit roof penetrations as indicated in the Contract Documents and Specifications.

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 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Burndy; Part of Hubbell Electrical Systems.
   2. Dossert; AFL Telecommunications LLC.
   3. ERICO International Corporation.
   4. Fushi Copperweld Inc.
   5. Galvan Industries, Inc.; Electrical Products Division, LLC.
   6. Harger Lightning and Grounding.
   7. ILSCO.
   9. Robbins Lightning, Inc.
   10. Siemens Power Transmission & Distribution, Inc.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.3 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 12 inches in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V and shall be Lexan or PVC, impulse tested at 5000 V.

2.4 CONNECTORS
A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.
C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
D. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

PART 3 – EXECUTION
3.1 APPLICATIONS
A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
B. Grounding Bus: Install in electrical equipment rooms in rooms housing service equipment and elsewhere as indicated.
   1. Install bus horizontally, on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
   2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.
C. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

3.2 EQUIPMENT GROUNDING
A. Install insulated equipment grounding conductors with all feeders and branch circuits.
B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

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 1 Specification Sections apply to this Section.

1.2 SUMMARY
   A. This Section includes the following:
      1. Hangers and supports for electrical equipment and systems.
      2. Construction requirements for concrete bases.
   B. Related Sections include the following:
      1. Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS
   A. EMT: Electrical metallic tubing.
   B. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS
   A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
   B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
   C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
   D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of [five (5)] times the applied force.

1.5 ACTION SUBMITTALS
   A. Product Data: For the following:
      1. Steel slotted support systems.
      2. Nonmetallic slotted support systems.

1.6 QUALITY ASSURANCE
   A. Comply with NFPA 70.
1.7 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section "Roof Accessories."

PART 2 – PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Allied Tube & Conduit.
      b. Cooper B-Line, Inc.; a division of Cooper Industries.
      c. ERICO International Corporation.
      d. GS Metals Corp.
      e. Thomas & Betts Corporation.
      f. Unistrut; Tyco International, Ltd.
      g. Wesanco, Inc.
   3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
   4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
   5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
   6. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
   1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
      a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1) Hilti Inc.
   2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
   3) MKT Fastening, LLC.
   4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A325.

6. Toggle Bolts: All-steel springhead type.


2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section "Metal Fabrications” for steel shapes and plates.

PART 3 – EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with single-bolt conduit clamps.
D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 pounds (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
   6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
   7. To Light Steel: Sheet metal screws.
   8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).
B.  Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

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 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Nonmetal conduits, tubing, and fittings.
   3. Metal wireways and auxiliary gutters.
   4. Nonmetal wireways and auxiliary gutters.
   5. Flexible Cable Tray.
   7. Handholes and boxes for exterior underground cabling.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.
   B. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Cable Tray routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
   1. Structural members in paths of conduit groups with common supports.
   2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Qualification Data: For professional engineer.

PART 2 – PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. AFC Cable Systems, Inc.
   3. Anamet Electrical, Inc.
4. Electri-Flex Company.
5. O-Z/Gedney.
6. Picoma Industries.
7. Republic Conduit.
8. Robroy Industries.
10. Thomas & Betts Corporation.
11. Western Tube and Conduit Corporation.
13. Snake Tray
14. Eaton
15. Cablefill

B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1, zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
2. Fittings for EMT:
   a. Material: Steel.
   b. Type: compression.
3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
2. Hoffman.
4. Square D.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type as indicated unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Hinged type and screw-cover type for NEMA 1 wireways and flanged-and-gasketed type for NEMA 3R and 4X unless otherwise indicated.

E. Finish: Manufacturer’s standard enamel finish.

2.3 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Adalet.
   2. Cooper Technologies Company; Cooper Crouse-Hinds.
   3. EGS/Appleton Electric.
   5. FSR Inc.
   8. Kraloy.
   10. Mono-Systems, Inc.
   12. RACO; Hubbell.
   13. Robroy Industries.
   14. Spring City Electrical Manufacturing Company.
   15. Stahlin Non-Metallic Enclosures.
   17. Wiremold / Legrand.

B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD with gasketed cover.

E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 pounds (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 pounds (23 kg) shall be listed and marked for the maximum allowable weight.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
I. Device Box Dimensions:
   1. 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).
   2. 4 inches by 2-1/8 inches by 2-1/8 inches deep (100 mm by 60 mm by 60 mm deep).

J. Gangable boxes are prohibited

K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type as indicated with continuous-hinge cover with flush latch unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Nonmetallic Enclosures: Fiberglass
   3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

L. Cabinets:
   1. NEMA 250, Type as indicated galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.
   6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.

2.4 Flexible Tray System

A. Cable tray shall be by one manufacturer and shall consist of straight sections, fittings, and accessories per NEMA VE1. Cable tray must be UL listed as equipment grounding conductors. There shall be no burrs, projections, or sharp edges to damage the cable insulation.

B. Material: Cold rolled steel with yellow zinc chromate plating.

C. Tray shall have a single round center spline. The center spline shall be of such gauge to allow it to be bent by hand while also supporting the weight of the loaded tray. The tray shall be hand bendable without the need to cut or modify the tray in any way to complete the bend. The tray shall be hand bendable without the need to add accessory parts to complete the bend. The tray shall support the cable installed within it every 4" by means on round spokes attached to the spline. The tray shall be designed in such a way as to allow cable to be added or removed from the tray without modifications to or the manipulation of the tray system. Sections of the tray shall be joined together using 1 connector device per joint. The tray shall have a single spline located above the cable path allowing the tray to self-level itself as it is loaded. The tray shall be designed in such a way as to allow it to be suspended from integrated mounting hardware every 4’ along the center spine. The tray shall be designed in such a way as to allow the tray to be attached to a wall. The tray shall supply a 4.25" wide by 4.25" deep cable path equaling 18 square inches of cable path.

D. Dimensions:
   1. Minimum 12" wide by 4" high.
   2. All cable tray sections shall be supplied in 8’ lengths.
   3. Minimum bending radius: 12”.

E. Accessories: Provide standard intersections, connector hardware, hanging hardware, and cable turnouts as manufactured by the tray manufacturer.
PART 3 – EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC.
   2. Concealed Conduit, Aboveground: GRC.
   3. Underground Conduit: RNC, Type EPC-80-PVC direct buried and or concrete encased.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4X unless otherwise indicated

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT.
   2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
   3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
   4. Damp or Wet Locations: GRC.
   5. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X stainless steel or nonmetallic in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size:
   1. 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
   1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
   2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
   4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

G. Install surface raceways only where indicated on Drawings.

H. Do not install nonmetallic conduit where ambient temperature exceeds 120 DegF (49 DegC).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply
with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Arrange raceways to keep a minimum of 1 inch (25 mm) of concrete cover in all directions.
   4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.

J. Stub-ups to Above Recessed Ceilings:
   1. Use EMT for raceways.
   2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

M. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

N. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

O. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
P. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

Q. Cut conduit perpendicular to the length. For conduits 2-inch (53-mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

R. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-pound (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

S. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.

T. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

V. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 DegF (17 DegC) and that has straight-run length that exceeds 25 feet (7.6 m). Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 DegF (55 DegC) and that has straight-run length that exceeds 100 feet (30 m).

2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 DegF (70 DegC) temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 DegF (86 DegC) temperature change.
   c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 DegF (70 DegC) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per DegF (0.06 mm per meter of length of straight run per DegC) of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per DegF (0.0115 mm per meter of length of straight run per DegC) of temperature change for metal conduits.

4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.

5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

W. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches (1830 mm) of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

X. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

Z. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

AA. Locate boxes so that cover or plate will not span different building finishes.

BB. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

CC. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
   2. Install backfill as specified in Section "Earth Moving."
   3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section "Earth Moving."
   4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
   5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
      b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Tape shall be detectable (by metal detector, etc.) and shall comply with requirements in Section "Electrical Identification."
3.4 Flexible Metal Cable Tray

A. Install cable trays per NEC Article 318 requirements, manufacturer’s instructions and as indicated or detailed on drawings. Ground cable trays per NEC Articles 250 and 318-7.

B. Prior to installing cable trays, coordinate cable tray routing with HVAC, plumbing, and related trades to avoid conflicts with ductwork, piping and other mechanical equipment.

C. Provide all necessary accessories such as elbows, dropouts, etc., required for the complete installation.

D. Install using wall brackets and trapeze type hangers with a minimum 3/8 inch threaded rod at each fastening point and at least every 8 feet. Provide all necessary hangers, rods, support channels, concrete inserts, and connectors between successive lengths of tray.

E. Provide and maintain sufficient space about the cable tray to permit access for installing and maintaining the cables.

F. Provide solid bottom, covered cable tray of the size indicated where it passes through walls and floors. Furnish fire-stopping in accordance with firestopping requirements specified in this section.

G. At all building expansion joints, expansion guides and connectors shall be provided in accordance with thermal contraction and expansion table, NEMA ve-1-5.07 in standard ve-1. Fixed hold down clamps shall be installed approximately midway between expansion joints.

H. Cable tray grounding: metallic cable trays that support electrical conductors shall be grounded as required for conductor enclosures per NEC Article 318-7 and NEC Article 250.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior wall assemblies. FIRESTOPPING

B. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section "Penetration Firestopping."

3.6 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
A. Description of Work: Provide nameplates, labeling, and other identification means for electrical systems equipment, devices, raceways and wires as indicated.

1.2 SUBMITTALS
A. Product Data: Manufacturer’s descriptive literature and/or samples for each type of nameplate, label, marker, etc., to be used on the project.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Amp, Brady, Hermes, Ideal, Panduit, Seton.

2.2 NAMEPLATES
A. Three-layer laminated plastic with minimum 3/16-inch high white engraved characters on black background and punched for mechanical fastening. Fasteners: self-tapping stainless-steel screws or number 10-32 stainless steel machine screws with nuts and flat and lock washers.

2.3 UNDERGROUND WARNING TAPE
A. Traceable Six-inch wide polyethylene tape, permanently bright colored with continuous-printed legend indicating general type of underground line below and “CAUTION.” Colors are as follows:
   1. Red - Electric.
   2. Orange - Communications.

2.4 MARKING PENS
A. Permanent, waterproof, quick drying black ink. Acceptable Manufacturers: Sanford Fine Point “Sharpie,” or equal.

2.5 WIRE TAGS
A. Vinyl or vinyl-cloth self-adhesive wraparound type indicating appropriate circuit number, etc.

PART 3 – EXECUTION

3.1 GENERAL
A. Clean all surfaces to receive nameplates, label, or marking, and prepare according to manufacturer’s written instructions.
B. Install nameplates centered and parallel to equipment lines, and secure with screws as indicated. Do not use rivets or adhesives.

C. Locate nameplate, marking, or other identification means on outside of equipment or box front covers when above ceilings and when in mechanical or electrical equipment rooms or other unfinished areas, and on inside of front cover when in finished rooms/areas.


E. Provide the following identification in addition to identification required by the NEC and equipment nameplates required by NEMA and UL.

3.2 NAMEPLATES

A. Provide an engraved nameplate (with minimum height characters indicated) for each:
   1. Power center, switchboard, distribution panel, and motor control center (1/2 inch H.).
   2. Overcurrent device, motor starter, and any other device mounted in any of the above (5/16 inch H.).
   4. Motor control station, and toggle switch located remote from load served or where function is not easily evident (3/16 inch H.).
   5. Communications and special system cabinet (5/16 inch H.).

B. Embossed “Dymo” tapes will not be an acceptable substitute.

3.3 UNDERGROUND WARNING TAPES

A. During trench backfilling for each underground electrical, telephone, signal and communications line, provide a continuous underground warning tape located directly above line, at six to eight inches below finished grade.

3.4 MARKING PEN LABELING

A. Mark each of the following, as indicated:
   1. Distribution panel and branch circuit panelboard tubs (indicate panel designation on inside of tub so that panel may be identified when its cover is removed).
   2. Branch circuit panelboard pole spaces (indicate respective circuit numbers). Note: Panelboard manufacturer supplied pole space identification means may be used in lieu of marking pen, except that pre-printed stickers will not be accepted.
   3. Branch circuit and feeder pull and junction box covers (indicate appropriate panel and circuit number(s) of conductors enclosed).
   4. Safety switch, individual circuit breaker and motor starter covers (indicate appropriate panel and circuit number serving the equipment).
   5. Wiring device coverplates (indicate appropriate panel and circuit number(s) serving the device(s)).
   6. Covers for communications and other special electrical systems pull, junction and outlet boxes. Indicate appropriate system and zone or circuit numbers, etc., as applicable. Use easily recognized system abbreviations (e.g., “FA” for fire alarm; “I/C” for intercom; “TEL” for telephone; “TV” for television antenna; “PA” for public address; “SEC” for security; “V/D” for voice/data, etc.).
3.5 WIRE TAGS

A. Power Circuits: Apply wire tag indicating appropriate circuit or feeder number to each conductor present in distribution panel and panelboard gutters, and to each conductor in pull and junction boxes where more than one feeder or multi-wire branch circuit is present. Where only a single feeder or multi-wire branch circuit is present, box cover labeling and conductor color coding is sufficient.

B. Control, Communications and Signal Circuits: Apply wire tag indicating circuit or termination number at all terminations and at all intermediate locations and boxes where more than one circuit is present.

3.6 BRANCH CIRCUIT PANELBOARD DIRECTORIES

A. For each panelboard, accurately complete the circuit directory card in typewritten form, identifying load served or “spare” or “space” for each circuit pole space. Use actual Owner designated room numbers or names (not construction room designations).

3.7 FUSES AND OVERLOADS

A. At each location where fuses are installed (safety switches, motor starters, control transformers, etc.) provide an adhesive label indicating fuse manufacturer, type, voltage and ampere rating, and affix to inside of enclosure front cover.

B. For each motor starter, provide adhesive label indicating overload element manufacturer, type, size and catalog number, and affix to inside of enclosure front cover.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Connect complete all equipment requiring electrical connections, furnished as part of this Contract or by others unless indicated otherwise.

PART 2 – PRODUCTS

2.1 GENERAL

A. Equipment and materials as specified elsewhere in Division 26 or as indicated on the Drawings.

PART 3 – EXECUTION

3.1 GENERAL

A. Equipment Variations: Note that equipment sizes and capacities as shown on the Contract Documents are for bidding purposes and as such may not be the exact unit actually furnished. Contractor shall anticipate minor variations in equipment and shall include in his Bid all costs required to properly connect the equipment actually furnished.

B. Verification: Obtain and review shop drawings, product data and manufacturer’s instructions for equipment furnished by others. Examine actual equipment to verify proper connection locations and requirements.

C. Coordination: Sequence electrical rough-in and final connections to coordinate with installation and start-up schedule and work by other trades.

3.2 ROUGH-IN

A. Provide all required conduit, boxes, fittings, wire, connectors and miscellaneous accessories, etc. as necessary to rough in and make final connections to all equipment requiring electrical connections.

B. In general, motors and equipment shall be wired in conduit to a junction box (or safety switch) near the unit, and from there to the unit in flexible metal or liquid-tight flexible metal conduit.

3.3 CONNECTIONS

A. Provide properly sized overload and short circuit protection for all equipment connected, whether furnished under this Contract or by others.

B. Verify proper connections with manufacturer’s published diagrams and comply with same.

C. Verify that equipment is ready for electrical connections, wiring and energization, prior to performing same.
D. Provide all control wiring to remote devices or equipment as indicated or required. Modify equipment control wiring, install or disconnect jumpers, etc., as required.

END OF SECTION
SECTION 26 24 16
PANELBOARDS AND CIRCUIT BREAKERS

PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Provide branch circuit panelboards, and/or distribution panels and circuit breakers as indicated.

1.2 SUBMITTALS

A. Product Data: Manufacturer, type, and general catalog information for panelboards, circuit breakers, and related equipment.

B. Shop Drawings: On 8-1/2-inch by 11-inch sheets indicating panelboard identification, short circuit rating, bus rating (volts, phase, amps), box dimensions, quantities and ratings of overcurrent protective devices (volts, amps, poles, RMS symmetrical amperes interrupting capacity), details of panel covers and fastening, locks and latches, and all special modifications of each panel (e.g., shunt-trip breakers, ground busses, barriers, contactors). For individual circuit breakers, include enclosure description.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Acceptable Manufacturers include:
   1. Square D. (Only to match existing panelboards within building)

2.2 PANELBOARDS

A. General: Panelboard rating, mains, mounting, and complement of breakers to be as indicated on the Panelboard Schedules.

B. Cabinet Rough-In Boxes: Code gauge galvanized steel with inturned flanges on all sides of front and minimum 20 inches wide. For panelboards with gutter taps, provide oversized cabinets as required for adequate gutter space. For double-tub panelboards, provide cabinets of identical height.

C. Panelboard Front Covers:
   1. General: Dead front, sheet steel, with rust inhibitive primer and baked light grey enamel or lacquer inside and out for surface mounted panelboards, and with non-glossy prime finish, suitable for final finish for flush mounted panelboards. Trim for flush panelboards to overlap box by at least 3/4 inches all around.
   2. Surface Mounted Panelboards: “Door-in-door” type covers with two doors for access into panels: a standard door and an outer door with minimum clear access into panel gutters of 2.5 inches on sides and 4 inches at top and bottom. Doors over protective devices with hinges concealed and welded to the back of the door and cover with door stops on the other three (3) sides. Provide NEMA 3R type enclosure for panels mounted exterior to building.
   3. Flush Mounted Panelboards: “Door-in-door” type covers with two doors for access into panels: a standard door and an outer door with minimum clear access into panel gutters of 2.5 inches on sides and 4 inches at top and bottom.
D. Latches:
1. Metallic, flush type with lock. Non-metallic, non-flush type latches or catches will not be acceptable.
2. Vault handle with 3-point catch: Provide for doors over 48 inches high.

E. Interiors and Bussing:
1. Panelboard Assemblies: Removable and with provisions for front trim adjustment. Panels to be designed so that removal of any branch circuit device does not disturb adjacent devices.
2. Mains: Where no main overcurrent protective devices are scheduled, provide panelboards with main lugs only, and sub-feed or through-feed lugs when indicated. Main lugs with anti-turn feature.
3. Bussing: Copper only. Bussing to be arranged for alternating phase connection of branch devices, all spaces equipped to receive branch circuit devices. Phase bus ampacity as indicated, and with neutral bussing having ampacity at least equal to phase bus ampacity. Provide box lugs or screw terminals for each conductor terminated plus not less than five spares.
4. Equipment Ground Bus (Copper Only): In each panel, securely fastened to inside of panelboard box near bottom of enclosure. For branch circuit panelboards provide terminals for at least 20 #14-8 conductors and a lug for the feeder equipment grounding conductor. For distribution panels, provide terminals for all grounding conductors present plus at least 25 percent spares.

F. Short Circuit Ratings: As indicated (minimum). Each panelboard shall be labeled with the required short circuit rating, taking into account the bus bracing and overcurrent protective device interrupting ratings. All devices shall be fully rated. Lower rated overcurrent protective devices based on series ratings with upstream devices will not be acceptable.

G. Panelboard Types:
2. Distribution Panels: Circuit breaker type.

2.3 MOLDED CASE CIRCUIT BREAKERS

A. General: Bolt-in type, indicating open, closed, or trip by handle position, with common trip for all poles, trip free toggle mechanism, long time and instantaneous tripping characteristics, and minimum RMS symmetrical interrupting capacities of: 10,000A for all breakers in 208/120V panelboards; 14,000A for all breakers in 480/277V panelboards. Provide breakers with higher ratings where indicated or necessary to meet required panel short circuit ratings.

B. Panelboard Mounted:
1. Breakers to be added to Existing Panelboards or Equipment: Same manufacturer, type, and interrupting rating as for the existing breakers in same panelboard or equipment, unless indicated otherwise.
2. Branch breakers in branch circuit panelboards to be arranged in the order as indicated in the panelboard schedules unless approved otherwise.

C. Individually Mounted:
1. Provide individually mounted circuit breakers where indicated with NEMA-1 enclosures unless indicated otherwise.

2.4 NAMEPLATES AND CIRCUIT IDENTIFICATION

A. Nameplates per Section "Electrical Identification."
B. Plastic covered circuit directory card mounted on the inside of the panel front covers with plastic protectors.

PART 3 – EXECUTION

3.1 CABINET INSTALLATION

A. As recommended by the manufacturer, secured to building structure or to steel framing, independent of conduits and raceways.

B. Surface Mounted Cabinets: Supported by at least four (4) fasteners with spacing not to exceed 30 inches.

C. Flush Mounted Cabinets: Supported by the wall construction wherever possible.

D. Operation: Verify that all breakers switch properly.

3.2 MOUNTING HEIGHT

A. General: 78 inches from the top of the cabinet to the finished floor except that 8 inches of clearance from the cabinet bottom to the floor shall be maintained unless doing so would exceed the maximum 6-foot 6-inch disconnect height allowed by the NEC.

B. Masonry Wall Joints: Even with the top of flush mounted panelboards.

3.3 CLOSURE PLATES

A. Cover all unused overcurrent device spaces.

3.4 FLUSH TRIMS

A. Paint (or arrange for painting) separately from related wall surfaces so that future removal of cover does not damage wall finish.

3.5 SPARE RACEWAYS

A. For each flush mounted panelboard, provide four (4) 3/4 inch raceways extending into the ceiling cavity at an accessible location. Terminate each raceway with a cap end, and tag capped end to indicate “Spare Use.”

3.6 IDENTIFICATION

A. Refer to Section "Electrical Identification."

3.7 PANELBOARD SCHEDULES

A. Refer to the Panelboard Schedules that follow or that which are on the Drawings. Final panelboard schedules shall be typed with date, contractors name, and telephone number.

END OF SECTION
SECTION 26
WIRING DEVICES

PART 1 – GENERAL

1.1 SUMMARY
A. Description of Work: Provide wiring devices and accessories as indicated.

1.2 SUBMITTALS
A. Product Data: Manufacturer’s descriptive literature for each type of wiring device and coverplate to be used on project.

PART 2 – PRODUCTS

2.1 GENERAL
A. All devices shall be UL-listed and meet all applicable ANSI, FS, and NEMA standards.

2.2 DEVICE COLOR
A. As selected by Architect, Engineer, or Owner.

2.3 GENERAL-USE SWITCHES
A. 20 amp, 120-277 VAC only, toggle-type, and single-pole, double-pole, 3-way or 4-way as indicated.
B. Acceptable Manufacturers:
   1. Leviton.
   2. Arrow-Hart.
   3. Hubbell.
   4. Pass and Seymour.

2.4 DIMMER SWITCHES
A. General: All dimmer switches must be compatible with the dimming ballast that it is controlling.
B. LED Dimmers (120/277v Volts): Solid-state type, 0-10V linear slide control, positive off position, high end trim, RFI filtering, circuitry that eliminates lamp flickering, single-pole or three-way switching as indicated, and matching finish for faceplates and slide controls. rated 1200VA. .
   1. Similar to:
      a. Leviton IllumaTech Slide Dimmer.

2.5 GENERAL-USE RECEPTACLES
A. Tamper resistant NEMA 5-20R configuration, 20 amp, 125 VAC, duplex type as indicated with wrap-around steel strap attached to back of receptacle and securely anchored into receptacle body near receptacle face and with automatic grounding feature.
B. Acceptable Manufacturers:
1. Leviton.
2. Arrow-Hart.
3. Hubbell.
4. Pass and Seymour.

2.6 GFI RECEPTACLES
A. Tamper resistant Ground fault circuit interrupter, feed through, duplex receptacle, NEMA 5-20R configuration, 20 amp, 125 VAC with solid-state ground-fault sensing and 5 MA trip level.

B. Acceptable Manufacturers:
   1. Leviton.
   2. Arrow-Hart.
   3. Hubbell.
   4. Pass and Seymour.

2.7 SPECIAL RECEPTACLES
A. As indicated on the drawings by ratings and/or NEMA configuration. Furnish to the Owner a matching 10-foot cord and plug set for each special receptacle. Provide submittals for each special receptacle type indicated.

B. Acceptable Manufacturers:
   1. Leviton.
   2. Arrow-Hart.
   3. Hubbell.
   4. Pass and Seymour.

2.8 COVERPLATES
A. General: Number of gangs, and openings to suit the number and type of devices.

B. General Use: Un-breakable plastic to match wire device type and color.

C. Dimmer Switch Coverplates: Plastic with no visible seams or screws, minimum 0.6-inch thick, white finish.

D. Weatherproof Coverplates: Suitable for the device indicated and type of outlet box used, cast aluminum or lexan. Receptacles installed in damp or wet locations shall comply with NEC 410-57.

E. Acceptable Manufacturers: Same as for general use switches and receptacles.

PART 3 – EXECUTION

3.1 MANUFACTURERS
A. Use only one manufacturer for all switches and general use receptacles. Use only one manufacturer for each type of device.
3.2 GENERAL

A. Switches: Install single pole switches so that the circuit is on when the handle is up.

B. Receptacles: Install receptacles with ground pin down where vertically mounted and on left when horizontally mounted.

3.3 GFI RECEPTACLES

A. For each receptacle designated or indicated to be “GFI,” provide a GFI receptacle. Do not substitute general use receptacle with feed-through GFI protection from upstream GFI receptacle. Do not use feed-through feature of any GFI receptacle.

3.4 CASEWORK AND WOODWORK

A. Do not cut openings for devices in casework or woodwork. Coordinate sizes and locations of cutting with casework or woodwork supplier. Furnish and install all electrical items indicated and necessary, except as noted. Conceal raceways and outlet boxes unless indicated otherwise.

3.5 GANGING

A. Where devices are shown adjacent (e.g., bank of light switches), mount all such adjacent devices under one multi-gang coverplate unless indicated otherwise.

3.6 COVERPLATE INSTALLATION

A. Install coverplates tight to wall, plumb, and level. Install receptacles so that device face is flush with or slightly ahead of coverplate face minimum of 0.015 inches (381 micrometers). Install blank fillers in coverplate openings not used. Grout or caulk as required to provide watertight seal for weatherproof coverplates.

CIRCUIT IDENTIFICATION

B. Refer to Section "Electrical Identification."

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
   A. Description of Work: Provide fuses as indicated or required. Fuses included in this Section are rated
   600 VAC and below.

1.2 SUBMITTALS
   A. General: Submit the following in accordance with Conditions of Contract and Division 1.
   B. Product Data: Manufacturer’s descriptive literature indicating fuse type and ratings, time-current
   curves on translucent (onion skin) paper, and peak current let-through for current limiting fuses. Supply data
   for each type of fuse. Different current ratings of the same type fuse may appear on the same sheet(s).
   C. Product Data: When indicated, manufacturer’s descriptive literature for the spare fuse cabinet.

1.3 EXTRA MATERIALS
   A. For each fuse size and type used on the project, provide one spare fuse for every ten installed but not
   less than six of each size.

PART 2 – PRODUCTS

2.1 GENERAL
   A. All fuses shall be UL Listed, and applied as indicated in its UL Listing and the manufacturer’s
   written instructions.
   B. The minimum voltage rating for fuses is 250 VAC for system voltages of 240 VAC and below, and
   600 VAC for systems voltages 600 VAC and below.
   C. Fuses shall never be applied above their ampere interrupting capacity (AIC).
   D. All fuses shall be new and supplied by the same manufacturer.

2.2 FUSES
   A. New installations: Provide the following types as indicated.
      1. Class CC: 600 volt, 1/10 - 30 amp, fast acting or time delay, current limiting, 200,000 AIC.
      2. Class RK5: 250 volt or 600 volt as required, 1 - 600 amp, fast acting, current limiting,
         200,000 AIC.
      3. Class RK-5: 250 volt or 600 volt as required, 1/10 - 600 amp, dual-element time delay, current
         limiting, 200,000 AIC.
      4. Class L: 600 volt, 601 - 6000 amp, time delay, current limiting, 200,000 AIC.
B. Existing installations and retrofits: Where existing equipment containing fuses is called for to be relocated or refused or a certain style fuse is required to maintain selective coordination, it is acceptable to use any of the following fuse types, subject to compliance with this specification.
   1. Class G: 480 volt, 5-60 amp, time delay, 100,000 AIC.
   2. Class K5: 250 volt or 600 volt as required, 1-600 amp, fast acting, 50,000 AIC.
   3. Class J: 600 volt, 1-600 amp, fast acting or time delay, current limiting, 200,000 AIC.
   4. Class T: 250 volt or 600 volt as required, 1-800 amp, fast acting, current limiting, 200,000 AIC.

2.3 FUSEBLOCKS
   A. Where indicated or required, provide UL Listed fuseblocks for fuses.
   B. Fuseblocks shall be specifically designed for the type of fuses intended to be used and installed per the manufacturer’s written instructions.

2.4 ACCEPTABLE MANUFACTURERS
   A. Acceptable manufacturers include:
      1. Bussmann.
      2. Gould Shawmut.
      3. Reliance.

PART 3 – EXECUTION

3.1 GENERAL
   A. Fuses shall not be installed until equipment is to be energized.
   B. Fuses shall be applied within their ratings. Any discrepancies shall be reported to the Engineer.
   C. Fuses shall be applied so as to provide selective coordination (i.e., the fuse directly upstream of the fault operates first).

3.2 FUSE APPLICATION
   A. Fuse ampacity: If not indicated, the fuse ampacity shall not exceed the maximum rating as allowed by the National Electrical Code and the equipment to be protected manufacturer’s installation instructions, whichever is less.
   B. Fuse type: If not indicated, use the following as a guideline.
      1. Control circuits and control transformers: Use Class CC, time delay.
      3. Main building and service disconnects:
         a. 600 amp and below, use RK1 or RK5.
         b. Above 600 amp, use Class L.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY
A. Description of Work: Provide safety switches as indicated.

1.2 SUBMITTALS
A. Product Data: Manufacturer’s descriptive literature indicating type, voltage rating, horsepower rating, ampere rating, number of poles, enclosure type, and accessories for each safety switch used on project.

1.3 QUALITY ASSURANCE
A. Referenced Standards: Switches shall be UL listed and labeled and shall meet NEMA and NEC requirements.
B. Manufacturer: Use only one manufacturer for all switches on the project.

PART 2 – PRODUCTS

2.1 SAFETY SWITCHES
A. General: NEMA heavy-duty, horsepower rated, fully enclosed, fusible or non-fused as indicated, quick-make/quick-break switching mechanism interlocked with cover, and integral handles that accept a minimum of three padlocks.
B. Neutral and Ground: Include insulated solid neutral terminal and/or solid grounding terminal, where circuits include these conductors.
C. Enclosures: NEMA types as specified below or as indicated. Provide NEMA-1 unless indicated otherwise.
D. Ratings:
   1. Voltage, phases, amperages and fusing as indicated.
   2. In the unfused configuration, switches shall have at least the following short circuit interrupting capacities:

<table>
<thead>
<tr>
<th>SIZE (amp)</th>
<th>INTERRUPTING CAPACITY 3-PHASE, SYMMETRICAL 600 VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 amp</td>
<td>950</td>
</tr>
<tr>
<td>60 amp</td>
<td>1,750</td>
</tr>
<tr>
<td>100 amp</td>
<td>1,800</td>
</tr>
<tr>
<td>200 amp</td>
<td>3,600</td>
</tr>
<tr>
<td>400 amp</td>
<td>10,000</td>
</tr>
<tr>
<td>600 amp</td>
<td>15,000</td>
</tr>
</tbody>
</table>
3. In the fused configuration, switches shall have an interrupting capacity of at least 100,000 amps symmetrical at 600 volts when used with Class RK-5 time delay current limiting fuses, and 200,000 amperes symmetrical at 600 volts when used with Class RK-1 current limiting fuses.

4. Switches shall have a withstandability rating expressed in amperes squared times time, times ten raised to the sixth power when tested at 480 volts, 3-phase with 54,066 amps available, 15 percent power factor and 685 volts first peak recovery voltage as scheduled below:

<table>
<thead>
<tr>
<th>SIZE</th>
<th>INTERRUPTING CAPACITY 3-PHASE, SYMMETRICAL 600 VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>800 amp</td>
<td>20,000</td>
</tr>
<tr>
<td>1,200 amp</td>
<td>30,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SIZE</th>
<th>WITHSTANDABILITY (12XTX106)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 amp</td>
<td>0.36</td>
</tr>
<tr>
<td>60 amp</td>
<td>0.95</td>
</tr>
<tr>
<td>100 amp</td>
<td>1.87</td>
</tr>
<tr>
<td>200 amp</td>
<td>5.80</td>
</tr>
<tr>
<td>400 amp</td>
<td>19.00</td>
</tr>
<tr>
<td>600 amp</td>
<td>47.00</td>
</tr>
<tr>
<td>800 amp</td>
<td>92.80</td>
</tr>
<tr>
<td>1,200 amp</td>
<td>208.80</td>
</tr>
</tbody>
</table>

E. Guards: Line shield guards to prevent contact with live parts.

F. Contacts: Silver alloy, switch blades shall be de-energized in the open position.

G. Lugs: Solderless type.

2.2 REJECTION FUSE CLIPS

A. Provide for fusible switches (30-600A) to prevent the installation of Class H and Class K non-current-limiting fuses.

2.3 AUXILIARY INTERLOCK KITS

A. Install where indicated or required, for simultaneously controlling separately powered control circuit associated with safety switch load. Control circuit contacts to break contact before and make contact after main safety switch contacts.

2.4 NAMEPLATES

A. Per Section "Electrical Identification."

2.5 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include:
   1. General Electric.
   2. Eaton
PART 3 – EXECUTION

3.1 GENERAL

A. Manufacturer: Use only one manufacturer for all safety switches on the project.

B. Type and Ratings: Provide non-fused safety switches unless specifically noted fused and ratings as indicated. If ratings are not indicated, provide switch with ratings to suit the system voltage and load served.

C. Enclosure Type: Provide NEMA-1 unless indicated otherwise. Provide NEMA-3R enclosures in exterior or damp locations, NEMA-4X enclosures in wet locations, and other enclosure types as indicated, or required to suit the application.

D. Mounting: Mount safety switches where indicated, and on wall or column adjacent to unit served or directly to unit or supporting framework where applicable.

END OF SECTION
PART 1 – GENERAL

1.1 SUMMARY

A. Description of Work: Provide motor controllers as indicated on the Drawings and specified herein.

1.2 SUBMITTALS

A. Shop Drawings: Submit the following in accordance with Conditions of Contract and Division 1.
   1. Product Data: For each controller provide a separate manufacturers data sheet with the following:
      a. Controller identification as called out in the Contract Documents.
      b. Controller information to include the ratings, dimensions, options and features.
      c. Motor load current and overload relay rating list: complied and submitted after acceptance testing demonstrating and overload relay selection.
   2. Wiring Diagram: For each control provide wiring and control logic diagrams.

B. Certified Reports: Indicating the testing and observations requested herein.

C. Operations/Maintenance Data: Complete operation and maintenance data for inclusion into the Operations and Maintenance Manual to include all shop drawings, test reports, and maintenance and repair manuals.

D. Field Test Organization Certification: Signed by the Contractor certifying the organization is in accordance with the requirements specified herein. Include a list of completed projects, Owners’ names, addresses, and telephone numbers along with the individual who performed the test.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide motor controllers and related equipment from manufacturers regularly engaged in the manufacture of equipment of the types and capacities indicated, with such products in satisfactory use in similar service for not less than 5 years. Manufacturer must also maintain, within 100 miles of the project site, a service center capable of providing training, parts, and emergency maintenance and repairs.


C. Listing and Labeling: Provide MCs that are listed and labeled.
   1. The terms “listed” and “labeled.” As defined in the National Electrical Code, Article 100.
   2. Listing and Labeling Agency Qualifications: A “Nationally Recognized Testing Laboratory” (NRTL) as defined in OSHA Regulation 1910.7.

D. NEMA Compliance: NEMA ICS 2, “Industrial Control Devices, Controllers, and Assemblies.”

E. UL Compliance: UL 508, “Electric Industrial Control Equipment.”

G. Field-Testing Organization Qualifications: To qualify for acceptance, a testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E699 that it has the experience and capability to conduct satisfactorily the testing indicated.

1.4 COORDINATION

A. General: Coordinate features of controllers and control devices with pilot devices and control circuits provided under other Sections covering control systems.

1.5 EXTRA MATERIALS

A. Spare Fuses and Indicating Lamps: Furnish one spare for every five (5) installed units but not less than one set of three (3) of each kind.

B. Motor Overload Relays: Provide a minimum of three of each type for each controller in a sealable package with the intended use clearly marked.

PART 2 – PRODUCTS

2.1 GENERAL

A. Manufacturers’ subject to compliance with these specifications, provide products from the following manufacturers:
   1. General Electric.
   2. ABB
   3. Square D
   4. Eaton.
   5. Siemens.

B. General: Coordinate the features of each motor controller with the ratings and characteristics of the supply circuit, the motor, the required control sequence, the duty cycle of the motor, drive, and load, and the pilot device, and control circuit affecting controller functions. Provide controllers that are horsepower rated to suit the motor controlled.

C. Size: NEMA rated based on horsepower or larger as indicated. IEC rated unacceptable.

D. Contacts shall open each ungrounded connection to the motor.

E. Overload Relays: Ambient-compensated type with inverse-time-current characteristic. Provide with heaters or sensors in each phase matched to nameplate full-load current of the specific motor to which connected with appropriate adjustment for duty cycle. Overload relays are not to be ordered until after inspecting the motor nameplate on the job site.

F. Enclosures: For individually mounted motor controllers and control devices, comply with NEMA Standard 250, “Enclosures for Electrical Equipment (1000 Volts Maximum).” Provide enclosures suitable for the environmental conditions at the controller location. Provide NEMA Type 1 enclosures for indoor and NEMA 4 for outdoor except as otherwise indicated.

2.2 MANUAL MOTOR CONTROLLERS

A. Description: Quick-make, quick-break toggle action, with thermal overloads, pilot light, lockable in the off position.
2.3 MAGNETIC MOTOR CONTROLLERS

A. Description: Provide full-voltage, non-reversing, across-the-line, magnetic controller.

B. Control Circuit:
   1. Control Power: Provide 120V control power transformer integral with controller where no separate 120V control power to controller is indicated. Provide control power transformer with adequate capacity to operate connected pilot, indicating and control devices plus 100 percent spare capacity. Transformer shall be connected to the load side of the motor’s disconnect switch.
   2. Overcurrent Protection:
      a. With Transformer: Provide fuses on both primary legs and one secondary leg. Sizes to be sized based on manufacturer’s requirements. In no case may the fuse size exceed the maximum size allowed by the NEC.
      b. Without Transformer: Provide fuses on each ungrounded leg sized based on manufacturer’s requirements. In no case may the fuse size exceed the maximum size allowed by the NEC.

C. Combination Controllers: Switch type, fused or non-fused as indicated; quick-make, quick-break switch, factory assembled with controller and arranged to disconnect it. Unit shall be designed for full voltage, across the line startings non-reversing; and lockable in the off position. For faced switches, provide rejection-type fuse clips and fuses as indicated. Provide defeatable interlock for switch and controller door.

D. Combination Controllers: Circuit breaker type, with adjustable trip circuit breaker, designed and listed for motor starting. Unit to be factory assembled, with circuit breaker arranged to disconnect the controller, and lockable in the off position. Unit shall be designed for full voltage, across the line starting, non-reversing.

E. Enhanced-Protection Overload Relay: Provide overload relays with NEMA Class 10 tripping characteristics where indicated. Select to protect motor against voltage unbalance and single phasing.

2.4 CONTROL DEVICES

A. General: Oil tight type, single hole mounting. Factory installed in controller enclosure except as otherwise indicated. Where separately mounted, provide NEMA 1 enclosure except as otherwise indicated.

B. Pilot Lights: Heavy duty LED type with pilot light colors green for motor running and other colors as indicated.

C. Pushbutton Stations: Heavy duty type. Labeled “Start” button, red button labeled “Stop,” and other designations as indicated.

D. Selector Switches: Heavy duty type. Maintained position type, 2-position “On-Off” and 3-position “Hand-Off-Auto” when in a circuit with an automatic device and other selector switches as indicated.

E. Minimum Requirements: For each magnetic starter, provide at least a “Run” pilot light and an “H-O-A” selector switch unless indicated otherwise. Provide alternate and/or additional control devices as indicated.

F. Remote Control Devices: Provide remote mounted control devices as indicated.
G. Control Relays: Heavy duty industrial grade, with number and type of contacts indicated, and 120-volt coil.

H. Elapsed Time Meter: Heavy duty with digital readout in hours.

PART 3 – EXECUTION

3.1 APPLICATION

A. Pushbutton Stations: Except as otherwise indicated, momentary-contact, start-stop units. Provide in covers of magnetic controllers for manually started motors where indicated, and connect start contact in parallel with sealing auxiliary contact for low-voltage protection.

B. Hand-Off-Automatic Selector Switches: Except as otherwise indicated, install in covers of manual and magnetic controllers of motors started and stopped by automatic controls or interlocks with other equipment. Make control connections so only the manual and automatic control devices that have no safety functions will be bypassed when the switch is in the hand position. Connect motor-control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor-overload protectors. Make control-circuit connections to a hand-off-automatic switch or to more than one automatic control device in accordance with an indicated wiring diagram or one that is manufacturer approved.

3.2 INSTALLATION

A. General: Install motor control devices in accordance with manufacturer’s written instructions.

B. Manufacturer’s Field Services: Arrange and pay for the services of a factory-authorized service representative to inspect the field assembly and connection of components, and supervise the pretesting and adjustment of solid-state controllers.

C. Location: Locate controllers as indicated and within sight of motors controlled.

D. Mounting: For control equipment at walls, bolt units to wall or mount on lightweight structural steel channels bolted to the wall. For controllers not at walls, provide freestanding racks fabricated of structural steel members and lightweight slotted structural steel channels. Use feet consisting of 3/8-inch thick steel plates, 6 inches square, bolted to the floor. Use feet for welded attachment of 1-1/2-inch by 1-1/2-inch by 1/4-inch vertical angle posts not over three feet on centers. Connect the posts with horizontal lightweight slotted steel channels and bolt the control equipment to the channels.

E. Motor-Controller Fuses: Conform to requirements of Section "Fuses."

3.3 IDENTIFICATION

A. Identify motor control components and control wiring in accordance with Section "Electrical Identification."

3.4 CONTROL WIRING INSTALLATION

A. Install wiring between motor control devices and control/indicating devices as specified in Division 26 Section “Motor Power and Control Wiring” for hard-wired connections.

B. Install wiring in enclosures neatly bundled, trained, and supported.
3.5 CONNECTIONS

A. Tighten connectors, terminals, bus joints, and mountings. Tighten field connected connectors and terminals, including screws and bolts, in accordance with equipment manufacturer’s published torque tightening values. Where manufacturer’s torquing requirements are not indicated, comply with tightening torques specified in UL 486A and UL 486B.

3.6 FIELD QUALITY CONTROL

A. Independent Testing Organization: Arrange and pay for the services of an independent electrical testing organization to perform tests and observations on motor control devices.

B. Reports: Prepare written reports certified by testing organization of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Include records of repairs and adjustments made.

C. Labeling: On satisfactory completion of tests and related effort, apply a label to tested components indicating test results, date, and responsible organization and person.

D. Schedule visual and mechanical inspections and electrical tests with at least one week’s advance notification.

E. Pretesting: On completing installation of the system, perform the following preparations for tests:
   1. Make insulation resistance tests of conducting parts of motor control components and of connecting supply, feeder, and control circuits. For devices containing solid-state components, use test equipment and methods recommended by the manufacturer.
   2. Make continuity tests of circuits.
   3. Provide set of Contract Documents to test personnel. Include full updating on final system configuration and parameters where they supplement or differ from those indicated in original Contract Documents.
   4. Provide manufacturer’s instructions for installation and testing of motor control devices to test personnel.

F. Visual and mechanical inspection: Include the following inspections and related work.
   1. Motor-Control Device Ratings and Settings: Verify that ratings and settings as installed are appropriate for final loads and final system arrangement and parameters. Recommend final protective-device ratings and settings where differences are found. Use accepted revised ratings or settings to make the final system adjustments. Prepare and submit the load current and overload relay heater list.
   2. Inspect for defects and physical damage, NRTL labeling, and nameplate compliance with current project drawings.
   3. Exercise and perform operational tests of mechanical components and other operable devices in accordance with manufacturer’s instructions.
   4. Check tightness of electrical connections of devices with calibrated torque wrench. Use manufacturer’s recommended torque values.
   5. Clean devices using manufacturer’s approved methods and materials.
   6. Verify proper fuse types and ratings in fusible devices.

G. Electrical Tests: Perform the following in accordance with manufacturer’s instructions:
   1. Insulation resistance test of motor control devices conducting parts to the extent permitted by the manufacturer’s instructions. Insulation resistance less than 100 megohms is not acceptable.
2. Use primary current injection to check performance characteristics of motor-circuit protectors and for overload relays of controllers for motors 15 horsepower and larger. Trip characteristics not within manufacturer’s published time-current tolerances are not acceptable.


4. Test auxiliary protective features such as loss of phase, phase unbalance, and undervoltage to verify operation.

5. Check for improper voltages at terminals in controllers that have external control wiring when controller disconnect is opened. Any voltage over 30V is unacceptable.

H. Correct deficiencies and retest motor control devices. Verify by the system tests that specified requirements are met.

3.7 CLEANING

A. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean devices internally using methods and materials as recommended by manufacturer.

3.8 DEMONSTRATION

A. Training: Arrange and pay for the services of a factory-authorized service representative to demonstrate solid-state and variable-speed controllers and train Owner’s maintenance personnel.

B. Conduct a minimum of 4 hours of training in operation and maintenance as specified under “Instructions to Owner’s Employees” in Section ”Closeout Procedures.” Include training relating to equipment operation and maintenance procedures.

C. Schedule training with at least seven (7) days of advance notification.

END OF SECTION
PART 1 GENERAL

1.01 DESCRIPTION

A. All cabling for voice and data will be CAT6. The general building contractor shall provide Inside Plant (ISP) pathways, which may include accessible utility corridors, finished and exposed metal cable tray or ladder, enclosed conduit, duct, or raceway including pull ropes to allow the installation of cable. Junction boxes shall be provided to allow installation of termination jacks at each station. The general contractor shall provide dedicated building closets, equipment backboards, wire management supports, termination racks, a grounding system, and an Outside Plant (OSP) conduit with pull ropes from the Building Distribution Frame (BDF) to nearest manhole.

B. US:IT will refer to the cable, which carries Telecommunications System signals, either integrated voice/data or voice only signals, as “voice” cable, i.e. voice riser, voice station cable.

C. ISP/OSP bid submittals shall include all costs for construction material, labor and any other items required for ISP/OSP installation.

D. The Contractor will be responsible for implementing all ISP/OSP per the design layout and specifications in its proposal. The design of all pathways and hardware shall allow for a 50% growth in capacity. This responsibility includes installation and termination of all ISP/OSP cabling to their proper equipment.

E. Particular consideration is to be given to the restoration of penetrated fire and smoke stop partitions and floor slabs to their original condition or to current fire code standards, whichever is greater.

F. The Contractor shall furnish blueprints, schedules and other technical data in order to illustrate to US:IT the intended method of installation. These shall define material type, path and concealment methods, distribution cable quantities, and room or wall space requirements. This information will be submitted prior to starting any portion of work and is subject to the approval of US:IT department.

1.02 DEFINITIONS

A. Inside Plant (ISP) is defined as intra-building distribution of cable media such as riser cable both fiber and copper coax, station cable, station jack hardware, Intra building Distribution Frame (IDF) terminals, sleeves, conduit, raceways, distribution frame hardware, etc. All other physical plant such as grounding, power, conduit, and raceway not considered OSP are part of the ISP.

B. Outside Plant (OSP) are all facilities used to support inter-building connections, including (but not limited to) copper, fiber and coaxial cable, splices, terminators, pairs protection, grounding systems, ducts, conduits, manholes, and all related outside infrastructure. Also included are Main Distribution Frames (MDF) and Building Distribution Frames (BDF).

C. Voice Cable – Cabling, which carries Telecommunications System signals, either integrated voice/data or voice only signals, i.e. voice riser, voice station cable.

D. Data Cable – Cabling, which carries data communications signals, i.e. data riser, data station cable, data fiber.

E. Video Cable – Cabling, which carries video or TV communications signals, i.e. video riser, video station cable, video coax.
F. Approved contractor – The bidder shall be Cat 6 certified. Also, must have a minimum of 5 years telecommunications/data installation experience. Cabling technicians must be certified installers. No more than one helper per certified installer. Certification of technicians must be shown if requested.

1.03 REFERENCES

A. All work shall meet all applicable codes and standards.
   5. US:IT requirements.

PART 2 PRODUCTS

2.01 OSP – DUCT SYSTEM

A. The Contractor shall be prudent in the design and installation and use of all available industry techniques to fully utilize individual ducts or raceways and avoid using existing spare ducts or raceways where feasible.

B. Each duct bank shall consist of three 4” conduits to each building. The duct bank sizing reflects the installation of video coax, data fiber, and voice cable. Contractors shall install Type C (Carlon 68515WH) and industry approved fittings. One 1¼” three cell maxicell shall be installed in one 4” conduit.

C. Where sharp bends or turns are required, prefabricated fittings will be used unless such bends or turns prohibit the pulling of large cables. In such cases, manholes or hand holes shall be installed.

D. Rigid conduit will be used where ducts run under roadways. Where conduits are installed in concrete slabs or where the minimum required depth is not feasible. All 4” Rigid conduits will extend a minimum of 10’ past the outside wall and attach to ducts feeding the building.

E. The duct systems shall be sloped to permit penetrating water to drain towards the manhole(s). The highest point of the duct array will be at the building entry point. All duct systems will be marked with the appropriate marking tape on top. There must be a minimum of 4 inches of sand above the conduits before backfilling.

F. All unused ducts shall be provided with removable conduit plugs or equivalent for waterproofing and protection. All ducts shall be cleaned of earth and debris, and equipped with minimum 200-pound strength pull rope.

G. All cables entering ducts shall be sealed according to industry standards and provide a watertight seal.

2.02 MANHOLES AND HAND HOLES

A. New manholes shall be reinforced concrete construction, cast-in-place or pre-cast, and must meet industry standards for telephone manholes.

B. The manholes/hand holes sizes shall be a minimum of 4’ x 4’ x 4’, up to a maximum of 6’ x 12’ x 7’ (see manhole/conduit drawings for manholes sizes and locations).

C. A PVC water barrier shall be installed at each construction joint.
D. Maximum distances between manholes and from manhole to buildings shall not be greater than 600 feet for a run containing an aggregate of a 45-degree bend and 400 feet for runs having an aggregate of a 90-degree bend.

E. On straight sections maximum distance between manholes shall be no greater than 600 feet.

F. Manhole lids will be permanently marked with the word “Telecom” or “Communications.”

G. Each manhole must have an integral 7/8” inch steel ring 6” diameter as part of the manhole structure. A 12-inch circular sump hole must also be included at the lowest point in a manhole.

H. All manhole covers must meet industry standards for vehicular traffic loads.

2.03 TRENCHING, BACK-FILLING AND RESTORATION OF GROUNDS

A. Trenching shall be done using trenching machines or backhoes and supplemented by hand excavation where required in order to avoid utility disruption.

B. Ducts shall be placed on top of four inches (4”) of sand bedding at the bottom of each duct run. An additional four inches (4”) of sand shall be placed around and between ducts. A final four inches (4”) of sand shall be placed on top such that an aggregate of twelve inches (12”) exists from the floor of the duct trench and the top of the last four inches (4”) of sand.

C. Below finished grade, just on top of the final layer of sand, and offset from the center of the duct bank, the Contractor shall place one (1) continuous plastic marking strip labeled “Communications.”

D. Gravel backfill shall be used in paved areas and earth shall be used in lawn area. Backfill shall be free of large stones of 3” in diameter or greater.

E. All backfill materials shall be compacted 95%.

F. The Contractor shall repair all the University grounds and property to their pre-construction condition using materials of same or better quality. This includes, but is not limited to, re-paving, re-seeding, walls, fences, landscaping, utilities, signs, painting, curbing, etc.

G. Bituminous materials should be used where necessary for repairing roads, parking areas, and footpaths. The materials shall be provided in two (2) courses: two 2” binders and a 1” surface course. All existing paths and roadways of greater depth shall be repaired to match existing materials and depths.

H. US:IT reserves the right to inspect all materials to be used in the process required in this section on trenching, backfilling, restoration of grounds, and to demand changes in type and quality in order to meet US:IT standards. Such changes will be at the Contractor’s expense unless US:IT requires materials of a higher quality than originally required by this document. In all cases concerning determination of “original condition”, US:IT will be the judge and have final approval.

I. Trench depth, from the bottom of the trench to the top of finished grade will be three feet, eight inches (3’ 8”) under pavement, and two feet, two inches (2’ 2”) under finish grade.

2.04 CABLE IDENTIFICATION AND LABELING

A. After final acceptance, Contractor will prepare and submit cable OSP drawings. These site drawings will be supplied on reproducible materials, and the Contractor will add its distribution system and show at a minimum:
   1. Exact route of total outside plant including trenching routes.
   2. Depth of cable trench.
3. Locator coordinates measurements from cable location to nearest building.
4. Cable number, cable pair count, wire gauge, cable lengths, and cable types of every OSP copper, coax and fiber cable included in the system.

2.05 OSP CABLE SIZING

A. Contractor will design an OSP that is complete.
   1. **All** OSP pairs must be terminated in Northern 191 or CIRCA #2200B-100 fuse protectors.
   2. **All** fiber cable shall be Hitachi 12 multi-mode 62.5/125 and 12 single-mode fibers or as specified.
   3. **All** cable shall be rated for outside usage in duct systems.

2.06 CABLE TYPE, SPLICES AND PROTECTION

A. All Copper cable used in OSP shall be waterproof with moisture and heat resistant properties up to 125 degrees, Gel-Filled Core Duct/Direct Burial type, with a Metal Clad composition. All wire shall be Twisted Pair type PE89 jelly filled 24 AWG solid copper cables.

B. All splice connections in manholes shall be placed in re-enterable waterproof closures and sealed according to manufacturer’s specifications. All splices shall be made with 3M modular connectors (4000-D) and enclosed in “Preform” enclosures.

C. All OSP will be properly grounded according to NEC Codes and BICSI Standards, and Local Codes and industry standards. All ground connections are subject to the inspection and approval of the US:IT, as well as State and Federal Inspectors.

D. All OSP will be enclosed in conduit or raceway where appropriate, such as required by Fire Codes, exposed to steam pressure relief valves, or in public areas.

2.07 ADMINISTRATIVE AND ACADEMIC BUILDING OSP DATA FIBER SIZING

A. Fiber cables shall be pulled to the BDF.

B. All fiber cables shall be properly terminated at the BDF.

C. In the fiber installation there will be no splices in the fiber cable, other than those at termination points.

D. All fiber cable shall be Hitachi 12 multi-mode 62.5/125 and 12 single-mode fibers or as specified.

2.08 OSP – VIDEO CABLE SPECIFICATIONS

A. All video cables for OSP will be Hitachi single-mode fiber.

B. Video fibers shall terminate on SC/APC fiber optic connectors.

2.09 CONFIGURATION AND SPECIFICATIONS FOR ISP

A. Where existing sleeves, riser conduit, etc., are insufficient for new riser cable, construction of new sleeves, cores, and conduit or raceway shall be proposed and included in the contractor’s purchase price. A minimum of twelve inches is required between all phone/data services and any electrical circuits. This is a US:IT requirement.

B. There must be a 50% growth factor built in on all conduit runs used for Voice, Data and Video jacks. Minimum conduit for station runs will be 1” trade size conduit with proper fittings. A 1” NMT non-metallic tubing properly installed meeting all NMT requirements of NEC/BISCI and the University of Maine is also acceptable. There will be NO DAISY CHAINING of jacks for any reason. A pull string needs to be installed in all conduits used for ISP/OSP cabling.
C. Open Ceiling – All conduits will be installed above the tray or back to the proper IDF/BDF.

D. Suspended Ceiling – All conduits will be stubbed above the ceiling or back to proper IDF/BDF. Install B-Line cable tray in all corridors providing a continuous pathway back to the proper BDF/IDF.

E. All old cables are to be removed as required by the NEC.

2.10 CABLE ROUTING

A. It is mandatory that the contractor makes use of and provides cable pathway materials between all building MDFs, BDFs or IDFs. A 50% growth factor must be provided when a job is completed. A minimum of 12 inches shall be kept between all data and electrical pathways when being designed (US:IT requirements).

B. Such pathway materials may include:
   1. Finished and exposed metal cable tray, ladder, or raceway.
   2. Enclosed conduit or wireway through walls or ceiling plenums.
   3. Sleeves and conduit.
   4. Other materials as the contractor may require.

C. Provide B-Line – Part # FT2X12X10. Must be mounted no more than 12” above suspended ceiling, or 8’ 6” in open corridors. A usable pull string is to be left in each cable tray on completion of cable installation.

D. It should be noted that US:IT will not supply pathway materials.

E. All raceways used for Telecom/Data shall be Panduit. They shall be sized properly for use. ONLY proper fittings for raceway shall be used.

2.11 CAT 6 REQUIREMENTS AND PARTS

A. All data cables shall be CAT6 Hitachi part # 30212-8.

B. All data cables installed shall be Hitachi part # 30212-8BL CAT6 with a PVC jacket being blue.

C. All dorm jacks shall be installed at 33” to bottom.

D. All E&G building jacks shall be installed 16” to the bottom.

E. All CAT6 cable shall be installed according to the NEC code, BICSI standards and EIA/TIA standards.

F. All CAT6 cable shall be installed on blue Hitachi part # 30212BL and terminated on Panduit jacks, part # CJ688PBB.

G. All CAT6 cable shall be 23 AWG and 8 conductors terminated as 568-A standards allow.

H. All raceway installed to be used for CAT6 installation must meet all BICSI standards as well as ANSI/TIA/EIA standards.

I. Cables shall terminate in proper Siemon part # HD6-24B-SIE patch panels rated for CAT6 specs, RJ45 faceplates with 110 terminations on back.

J. Patch cables rated for CAT6 100mb are to be supplied and installed.

K. CAT6 certification must be received prior to final payment.
L. Velcro required to tie and support cables.
M. All raceways for IT shall be properly sized for Panduit or 1” conduit.

2.12 DISTRIBUTION FRAME REQUIREMENTS

A. New IDF and BDF room construction shall be included in Building Design blueprints.

B. There shall be included, in the building, an equipment room as designated by US:IT strictly for data telecommunications. All BDF and IDF rooms shall be a minimum of 8’ x 10’ x 8’, with signage indicating that the room is a data telecommunications facility.

C. An IDF room will be required per floor in order to keep distance requirements for CAT6 wiring within specifications. This room(s) shall be keyed to the telecommunications master key. A 50 pair feeder cable for voice shall be run to the BDF room from each IDF room. These cables should run in pipe chases of 4” conduits. A 12/12 fiber riser cable will be run from BDF to each IDF for data feed. BICSI and NEC standards and US:IT requirements must be met. RJ11 coax shall be installed to each IDF from the BDF. Air temperature and air movement should meet office requirements for the building.

D. BDF/IDF rooms should have a switched light with 50 ft. candles available and at least two isolated duplex outlets rated for 20 amps. A covered # 6 copper ground wire and bus bar must be installed at each IDF from main grounding frame in BDF and from racks installed at each IDF/BDF.

E. A # 4 copper ground wire, properly installed and terminated, will be required in all BDF rooms, part # SB477K.

F. Two 4” conduits from BDFs to IDFs with pull strings installed.

G. Three 4” conduits feeding BDF from OSP manholes.

H. All conduit, raceway, coring, and equipment backboards must be supplied and installed by the Contractor.

I. Contractor will be required, prior to start of project, to submit a floor-by-floor list of where new BDFs and IDFs will be required.

J. No sprinkler heads should be installed within the BDF/IDF rooms. Heat/smoke detectors should be installed where necessary for fire code compliance.

K. All cable will be marked clearly and legibly at both ends.

L. All cables and fiber shall be terminated on a 7’ x 30’ x 19’ rack. All installed equipment shall meet all BISCI requirements as well as US:IT requirements. All racks shall be properly bonded to ground bar in IDF/BDF rooms.

M. One wall having a 4’ x 8’ x 3/4” sheet of plywood attached painted with fire retardant paint is required in the BDFs and IDFs. Plywood should be vertically mounted behind the racks installed 2’ off the finished floor.

N. Wire management hardware located on three (3) walls above the racks is required in preparation of installation of termination equipment by the contractor (see diagram included in this document BDF/IDF requirements closet).

O. Single-mode fiber will be fusion spliced to factory ceramic SC and SC/APC pigtails.

P. Multi-mode fiber will be terminated using ST Unicams factory polished ceramic.

Q. All fiber patch panels are to be Seicore, sized to accept fibers from the OSP plant as well as riser for the IDFs.
1. Data telecommunication rooms (including but not limited to BDF and IDF closets): The BDF closets shall be on the lowest floor level of the building being served. An IDF closet is **required** for each floor above the lowest floor.

2. All BDF/IDF closets shall be designed as shown in the diagram below. Materials for this requirement are shown in the diagram.

3. All data telecommunication rooms must have a 3’ door swinging out into the hallway.

4. All data telecommunication rooms are for **INFORMATION TECHNOLOGIES USE ONLY**; any other equipment needing IT service should be located in a separate mechanical room.

### 2.13 CABLE SUPPORT AND RACK PRODUCTS

A. All material to be installed to product specifications.

B. All material to match cable trays installed in the building.

C. All racking and cable tray to be grounded with # 6 green PVC ground wire.

#### BDF/IDF REQUIREMENTS (EXAMPLE USING B-LINE AND (SB) HARDWARE)

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description of Item</th>
<th>Item Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>End Bracket Relay Wall Bracket</td>
<td>SB87019S2FB</td>
</tr>
<tr>
<td>2</td>
<td>Runway Wall Bracket</td>
<td>FTB12CS</td>
</tr>
<tr>
<td>3</td>
<td>90 deg. Splice Bar</td>
<td>90DEGREE KIT</td>
</tr>
<tr>
<td>4</td>
<td>Fast Splice Bar</td>
<td>FTSTLC</td>
</tr>
<tr>
<td>5</td>
<td>Cable Runway B-Line</td>
<td>FT2X12X10</td>
</tr>
<tr>
<td>6</td>
<td>Splice Washer Kit</td>
<td>WASHERSPL KIT</td>
</tr>
<tr>
<td>7</td>
<td>Runway Termination Kit</td>
<td>SB-2105-12-TG</td>
</tr>
<tr>
<td>8</td>
<td>Copper B-Line Vertical Management</td>
<td>SB57166D084AL</td>
</tr>
<tr>
<td>9</td>
<td>Copper B-Line Aluminum Rack</td>
<td>SB556084XUAL</td>
</tr>
<tr>
<td>10</td>
<td>Horizontal Management</td>
<td>CMPHH2</td>
</tr>
<tr>
<td>11</td>
<td>20 AMP Dedicated Electrical Outlet</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Wire management required around each frame: top, bottom and side. This will be sized to fit each building requiring size changes to match density and count of building. All products and fittings are B-Line Cable Tray and fittings.
2.14 CABLE NETWORKS IDENTIFICATION AND LABELING

A. Each contractor shall permanently mark all cables with permanent labels.

B. Labels shall be waterproof materials with indelible text information and mechanical attachment or waterproof adhesive.

C. Each required label location shall contain all fields of required information below.

D. Required identification information shall include the following items, combined to produce a unique and non-duplicating identification for each cable. No two jacks within the cable plant shall have the same number.

E. Jacks shall show termination location; floor location and BDF/IDF location (i.e. basement – BDF A001; 1st floor to IDF B101; 2nd floor to IDF C201).

F. Where multiple cables have the same termination location and floor identification number, the contractor shall add an alpha/numeric suffix to provide non-duplicating identifiers (i.e. A201, A201B).

G. All jack locations should run straight back to the equipment rooms or cable trays in their own raceway.

H. Equipment rooms should have a switched light and at least two duplex outlets rated for 20 amps.

I. Pull strings are to be installed at the time of construction in all conduits.

J. If utilized, pull strings must be replaced prior to completion of project.

K. Cables need to be toned and correctly labeled at the time of installation.

L. Riser fiber cable shall be 12 strand multi-mode and 12 strand single-mode fiber.

M. Cables for voice and data shall not exceed 290’ end to end.

2.15 UNIFORM WIRING PLAN (UWP)

A. Below are the jacks and symbols to be used by the contractor when cables and terminations are installed. Panduit jacks and equipment will be used. All jacks will be wired as 568A and meet CAT6 certification.

B. UWP#1s – Consists of three separate cables (23 AWG), 2 blue data and 1 RG6 coax. (See symbol 1 above).

C. UWP#2s – Consists of two separate cables (23 AWG), 2 blue data, these are the standard for all offices. (See symbol 2 above).

D. UWP#3s – 1 blue voice cable only (23 AWG). This jack is used for alarm circuits mostly. (See symbol 3 above).
E. UWP#4s – 1 blue data cable (23 AWG). Used where no phone will ever be needed but data transmission is required. An example would be an in-house billing system, i.e. Harco. (See symbol 4 above).

2.16 VOICE AND DATA CABLE SPECIFICATIONS FOR HORIZONTAL CABLEING

A. Cables will be 23 AWG 8 conductors Unshielded Twisted Pair (UTP).
B. All cables will be blue category 6 four pair and comply with EIA/TIA 568A standards.

2.17 VIDEO WIRING PLAN (UMP)

A. The contractor must install F59SSV quad shielded RG 6 type drop cables for subscriber loop locations. RG6 type subscriber drop cables are used to interconnect the TV outlet with multi-tap devices that will be installed at the BDFs or IDFs.
B. At the outlet, the contractor shall terminate the cable in the outlet connector using an F10F10S11-X straight jack. The TV outlet shall then be terminated using a 75-ohm F terminator.

2.18 VIDEO RISER CABLES

A. Where video riser cables are required between floor types F11SSEF and single-mode fiber will be installed.
B. Routing of video riser cables follows voice cable installation from floor to floor.

2.19 WIRELESS NETWORKING REQUIREMENTS

A. One (1) 1” conduit run to each location for networking cables.
B. Conduits will terminate either at BDF, IDF or above the cable trays with CAT6 data cable being installed.
C. All ANSI/TIA and NEC codes or requirements must be met.

2.20 CAMERA INSTALLATION

A. A 1” conduit from the camera location back to the cable tray or above suspended ceilings.
B. Conduits will terminate either at BDF, IDF or above the cable trays with blue CAT6 data cable being installed.
C. A blue CAT6 data cable shall be installed and terminated in an RJ45 Panduit jack.
D. Jack shall be labeled to show proper BDF or IDF location, i.e. Jack A1001 for BDF or B2001 for IDF.
E. Cameras to be used are axis 216FD for fixed dome inside installation.
F. Outside cameras are to be axis and will be listed by their needs. Recommended part # AXIS 223M, Outside Housing recommended part # AXIS #24889, including heater and blowers.
G. NUV for each building to be installed in BDF rooms equipment rack, part # 1PNUR1UST4TB8R must be able to record for 28 days.

2.21 OUTSIDE EMERGENCY PHONES
A. Two 1¼” conduits run to pedestal location, 1 for Telecom/fiber cables, and 1 for electrical circuit to be installed with ground fault interruption 20 Amp minimum 120v rated. Each to be terminated in the proper equipment rooms, i.e. electric to electric panel, IT to proper BDF room.
B. 1¼” conduits need to be rated for outdoor use, PVC schedule 40 recommended.

C. Symbol for location(s) is:

2.22 US:IT VOICE AND DATA CABLE SPECIFICATIONS FOR JACKS

A. All cables are 23 AWG 8 conductors unshielded twisted pair cable.

B. Category/Level 6 – cable must be 8 conductor and comply with EIA/TIA 568-A standards.

C. Color-coded with a blue PVC jacket.

D. DC Resistance 9.38 @ 100 meters.

E. DSC Resistance Unbalanced 5% maximum.

F. Impedance @ 250 MHZ 100 ± 15%.

G. Category/Level 6 – When requested for installation, specs will be given and approval from Telecommunications on the cable to be installed will be given.
   1. Characteristics:
      a. Propagation Delay @ 10 MHZ 5.7 per/meter.
      b. Delay Shew @ 25NS/100 meters.
      c. Attenuation crosstalk 11.4 db @ 250 MHZ.
   2. Specifications:
      a. Blue PVC jacket.
      b. 8 Conductors 23 gauge.
      c. DC Resistance 9.38/100 meters.
      d. DSC Resistance unbalanced 5% maximum.
      e. Pair to ground capacitance unbalanced maximum @ 1 KHZ 100m.
   3. Transmission Properties:
      a. Freq 427.0.
      b. Maximum attenuation @ 20 deg. Celsius 50.5.
      c. Near end crosstalk worst pair combination 64-15log (F/00.772).
      d. Power Sum N/A.
      e. Worst Pair SRL 10 db.
      f. Resistance OHMS 100 115%.

2.23 INSTALL LEVEL 6 STANDARDS

A. ANSI/TIA.E1A 568A Category 6 E (400 MHZ):
   1. 155 mbps ATM and 100 mbps Ethernet.
   2. 4 pair 23 gauge copper.
   3. ISO/IEC 11801.
   4. Min Bend Radius .820.
   5. PVC Blue Jacketed.
   6. Cable markings starting at 0 to 1000’ per box.

B. ETL Verified Electrical Performance:
   1. CAT6 STANDARDS:
      a. Input Impedance 100 ohm ± 15 ohm 1-100 MHZ.
      b. Capacitance 4.6 NF/100 m nominal.
      c. DE Resistance/Unbalanced 6.66 ohms/100 m max.
      d. Propagation Delay 5.7 N/SEC/m mac at 10 MHZ.
2.24 TEST RECORDS FOR ISP/OSP

A. Contractor will test each OSP pair in each cable on an end-to-end basis after terminating. Maximum allowable defective pairs will be limited to 1% of the total number of pairs and a maximum of one (1) pair per 25-pair binder group. Defective pairs over 1% will require cable repair or replacement at the Contractor’s expense.

B. ISP testing for each station cable is required with zero defective pairs acceptable.

C. The Contractor, at no cost to the University, will replace cables rejected by the US:IT department with new cable from end to end.

D. Records of testing will be delivered to US:IT in MSExcel format, or software that is compatible with MSExcel.

E. Building will not be accepted for service prior to records being received, thus no service will be provided.

PART 3 EXECUTION

3.01 OSP – FIBER INSTALLATION

A. No splices will be allowed in OSP fiber. Any faulty cables must be replaced at Contractor’s expense.

B. All fiber cable must be installed in accordance with manufacturer recommended tensile specifications.

C. Lubricant must be used when installing fiber cable. This lubricant must be manufacturer guaranteed to be non-destructive to the cable sheath or any portion of the inner duct.

D. All fiber cables shall be terminated in an approved Lynn patch panel using approved ST, SC or SCAPC connectors. All connections shall be fusion splicing onto correct connectors. Labels shall show the destination of each fiber optic strand.

E. All fiber cable will be tested for loss and bandwidth according to the manufacturer’s specifications. Tests shall be performed after all the cable has been installed, spliced and terminated.

F. All fiber cable shall be 62.5/125 multi-mode or hybrid Hitachi/Corning Fiber containing twelve multi-mode fibers and 12 single-mode fiber rated for outside usage in duct system.

3.02 OSP – DATA FIBER INSTALLATIONS

A. Specifications for Altos/Lst Cables:
   1. Maximum attenuation: 3.5/1.0.
   2. Minimum bandwidth: 120/500 850 MHZ to 1300 MHZ.
   3. Gigabit Ethernet Distance Guarantee 500/1000.
   5. Graded Index: 50 Gigabit Plus CL.
   6. 62.5/125 micron core diameter (+/-3).
   7. Maximum Tensile Loading: 600 lbf.

B. The Contractor is responsible for installation and testing of fiber. A loss of more than 2dB is not acceptable.
C. All fiber cable must be installed in accordance with manufacturer recommended tensile specifications.

D. All fiber cables shall be terminated in an approved patch panel using SC ceramic ferrule connectors. Single-mode fiber must also be properly terminated and marked using SC/APC or SC pigtailed, both need to be fusion spliced. Labels shall show the destination of each data fiber optic strand.

E. All fiber must be tested prior to installation with an Optical Time Domain Reflectometer (OTDR) to insure cable integrity and to identify any damage due to shipping. An OTDR graph must be delivered to the University prior to the installation of the fiber cable and after the cable has been installed.

3.03 DATA FIBER TESTING

A. All fiber cable must be tested to guarantee the performance integrity of cables, bends, tensile loads and terminations or cross connects.

B. Each fiber cable must be tested for loss and bandwidth. Tests shall be performed upon completion of installation and termination.

C. Any cable that is found to be defective shall be repaired or replaced at the contractor’s expense.

D. An OTDR graph must be provided for each fiber strand tested.

E. Testing must be accomplished with an OTDR.

3.04 INSIDE PLANT (ISP) INSTALLATION

A. The cable will be less than 280 feet from station jack to distribution frame termination.

B. All cable paths that will be used for Category 6 cable installation must meet all applicable codes, BICSI and ANSI/TIA/EIA standards.

C. When a cable must be created in an existing building, the following concealment methods are acceptable:
   1. Dry wall: fishing of hollow wall cavities.
   2. Plaster or Tile Wall: Color coordinated wire mold.
   3. Drop ceiling: Velcro every 10’ and avoid lighting fixtures and all electrical conduit and raceway.
   4. Utility Corridors: Concealment not required; Velcro every 10’ to (chases and trays) to self-supporting hangers, avoid receptacles and all electrical conduit/raceways. Clear and free conduit or riser sleeves are available for use wherever they are found and should be used first.
   5. Raceway shall be installed where indicated and when required to run on the surface of a wall. Raceway shall be Panduit and must be properly sized and meet the installation requirements of the manufacturer of the cable to be installed.

END OF SECTION 27 00 00
PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: Access Control/Facility Monitoring System.
   1. Contractor shall provide all Access Control/Facility Monitoring System AC/FMS equipment, mounting equipment, manufacturer specific back boxes, head end control equipment, interconnect wiring, and testing unless otherwise noted. The Owner shall provide all category network wiring and programming of the AC/FMS. Contractor shall coordinate with the Owner and provide testing time once programming is completed to ensure correct hardware operation.
   2. Contractor shall provide all cable trays, J-hooks, universal back boxes, raceways, junction boxes, 120VAC emergency power wiring, and receptacles. Refer to Division 26 specifications for additional information on these items.

1.2 REFERENCES

A. UL (Underwriters Laboratories, Inc.) 305 – Standard for Panic Hardware
B. UL (Underwriters Laboratories, Inc.) 294 – Standard for Access Control System Units
C. FCIA (Firestop Contractors International Association) – Manual of Practice
D. FM (Factory Mutual) Global – Class 4991 – FM Approval Standard of Firestop Contractors
E. IEEE (Institute of Electrical and Electronics Engineers) C62.41 – Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
F. NFPA (National Fire Protection Association) 262 – Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
G. NFPA 70 (National Fire Protection Association) - National Electrical Code
H. UL Qualified Contractor Program for Firestop Systems and Spray-Applied Fire Resistive Materials (SFRM’s)

1.3 DEFINITIONS

A. Access Cycle: A grouping of 7 day types, one for each day of the week, that defines when an event will occur or when access will be granted during a repetitive weekly time frame.
B. Access Level: A group of doors, up to 512, to which one of the system access cycles has been assigned to each door. This determines when an individual or group of personnel will be allowed access through any of the doors assigned to the access level.
C. Access Period: An increment of time defined by a beginning time and ending time that is used to designate when an event will occur or when access will be granted.
D. AC/FMS: Access Control/Facility Monitoring System.
E. AC/FMS Server: A Transact System server with UPS backup that reports back to the main Transact System located at University of Maine primary campus @168 College Ave, Orono, ME.

F. Alarm: Any of the possible normal system transactions or conditions produced by the system controllers that are designated by the operator as alarm conditions. Designation of the alarms is made using the alarm assignment function.

G. Anti-Passback: An individual is allowed access at the entry reader of a controlled point but is denied further use of the key/card for additional entry at the controlled point until the key/card has been used in the exit reader associated with the same controlled point.

H. Auto-Unlock: The free access period given to a particular door, output, or floor when an unlock cycle time period is assigned to it. This function overrides normal key access operation and places the door, output, or floor in an unlocked or activated state for the duration of the assigned period.

I. BLCM: Badge Layout Control Module. AC/FMS System component for ID badge production.

J. CD/SD: Cardholder database/screen designer.

K. Database: Values, times, schedules, employee data, etc. that are maintained by the server, controller and/or workstation.

L. Day type: A group of up to 4 access periods within a 24-hour period, that does not overlap, that will define when an event will occur or access will be granted during the 24-hour time frame.

M. Ethernet: Owner data network structure required for communication between equipment control units. Ethernet equipment and structure are required for established Transact System.

N. Event: A normal system transaction or condition that occurs within the system.

O. FICC: Facility Information Center Coordinator. Network support technician at each facility.

P. GUI: Graphical User Interface.

Q. IP: Internet protocol (address connection data outlet).

R. BW: Imaging workstation. Badging for access control cards are produced at this workstation.

S. Key Bypass: A remote keyed switch wired directly to magnetic lock at door location used by emergency personnel to disable door lock for emergency access through door. Entry with key bypass alarms the AC/FMS.

T. Wide Area Network (WAN): The communication network utilized between the AC/FMS server, workstations, and controllers in a multiple workstation system.

U. Local Area Network (LAN): The Facility Ethernet network where all controller interfaces are implemented on a system that employs multiple operators or multiple workstations to perform simultaneous operations.
V. Controller: An electronic device that resides on any of the networks associated with the AC/FMS server and workstations. They may also be considered those controllers that are located at the same physical site or remote to the AC/FMS server or workstations and does not utilize a modem or dial telephone network for the communication. They control readers, door release, and door processing events and retain the system memory for its related components. Some controllers are hardwired to other upstream controllers where required due to lack of data outlets or IP address limitations.

W. Operator: An authorized person that is designated as having the capability of programming, operating, or monitoring the activities of the AC/FMS.

X. Reader: Access Control programmed card reader for controlled access into designated spaces. Proximity, RF, and/or Smart Card Biometric type.

Y. Request to exit: A remote key switch, button, passive infrared detector, or integral contact to door hardware, when activated, requests release of door magnetic lock (if present) through the Intelligent System Controller. Valid requests to exit bypass door contact for non-alarm entry or exit through door.

Z. SQL: Structured query language; refers to statements that specify a function. SQL reports may be established to provide standards Owner Safety Office reports of system operation.

AA. TCP/IP: Transmission control protocol/internet protocol; designation for communications standard that allows inter-operability between new technologies and existing platforms.

BB. User Assignment: Assignment to the user's key or card number to an access level. This determines when a particular user will be granted access to which doors.

CC. Workstation: A computer, monitor, keyboard, mouse, and UPS that allow the operator to interface with the AC/FMS when a multi-user, multi-workstation system is required. A workstation is directly connected to the LAN network and communicates with the AC/FMS server over the WAN.

DD. Hold-up/Panic Button: An under-counter momentary push button that, when pressed, sends an emergency duress alarm via the AC/FMS to Public Safety.

EE. Remote Door Release Button: A wall-mounted momentary push button that, when pressed, sends an input to the AC/FMS to unlock the designated opening.

1.4 SYSTEM DESCRIPTION

A. The access control/facility monitoring system (AC/FMS) controls and monitor doors and remote security systems located throughout the campus.
   1. When a card is read by a reader it is processed by a controller to determine if it is a valid card and if the card has rights to open the associated door.
   2. Each transaction is printed and displayed on activity monitors.
   3. Status of doors that are controlled by readers and doors that are monitored via a door position switch are continually monitored.
   4. An alarm is generated if one of the monitored doors is opened without a valid reader request or exit request.

B. The AC/FMS is fully integrated, combining access control, alarm reporting and acknowledgement, alarm graphics (where established), standard reports, and video badge imaging systems into a distributed control and management system.
   1. The AC/FMS is a distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment supporting an Ethernet LAN.
a. Access control decisions, (permit or deny entry) are made by each controller, utilizing its database. The controller reports all field events to the AC/FMS server over LAN/WAN connections for display, response, and records retention purposes.

2. The workstations are connected through LAN/WAN connections to the AC/FMS Server.

C. The AC/FMS provides management and control of individual personnel access to selected areas, the monitoring of facility alarm devices, and the regulation of entry/exit control devices while simultaneously maintaining archival data to generate printed reports relating to all controlled activities.

D. The AC/FMS integrates a number of functions with overall administration performed by the AC/FMS Server. The following sub-systems are features of the AC/FMS architecture:
   1. Access control.
   4. Historical reporting.
   5. Audit trail.
   6. Personnel locator.
   7. Dynamic color graphics – showing all floor plans and device locations. Not presently in use
   9. Video ID badging and card printing.

E. Alarm monitoring can be accessed using the following methods:
   1. Local monitoring via the LCD laptop (workstation) located within the equipment rack in the 1st floor I.T. Room 109C.
   2. Remote monitoring via the main Transact System located at University of Maine primary campus @168 College Ave, Orono, ME.

F. The AC/FMS Server that communicates with the facility AC/FMS is located at University of Maine primary campus.
   1. Workstation provided by the Owner will be network-capable for connection to the AC/FMS Server via LAN/WAN network. Provide network repeaters as required for proper network communications.
   2. Database population for the facility database personnel shall be accomplished by the Owner from existing files.
   3. The personnel database in the AC/FMS server will have information about badge holders, such as name, address, department, access rights, and personnel type.

G. System Alarm and Monitoring Functions:
   1. Priority Levels: Up to eight priority levels may be user programmed (the 3 level priority system below is a minimum).
      a. Priority Level 1: Life safety/exterior breach attempt (duress, fire alarm, camera motion detector).
      b. Priority Level 2: Interior breach - non-controlled doors.
      c. Priority Level 3: Normal function door denials.
   2. Request to Enter from Reader: System grants or denies request.
      a. Grants Request: Door will open, and transaction is recorded.
      b. Denied Request: Door remains closed, transaction is recorded. User may program denied request as an alarm condition if desired (Priority Level 3).
   3. Door Forced Open (Monitored doors and reader equipped doors): An alarm is recorded, priority level 2, however, user may change priority level at any time.
4. Anti-Pass Back (All doors may be considered as anti-passback): Prevents a card from being passed back to be used again on entry. Doors configured for anti-pass back are controlled such that a request for entry must be followed by a request for exit until the request for entry is accepted again. The duration between requests is unlimited.

5. Request for Entry/Exit Approved: Records a transaction.

6. Request for Entry/Exit Denied: Records a transaction, issues a priority level 2 alarm.

7. Fire Alarm Activation: System is programmed for “fail-secure” mode in the event of fire alarm activation.
   a. Upon signal from the fire alarm system that an event has occurred, a priority level one alarm is issued to workstation(s).
   b. The exit doors in the building in which the alarm has occurred DO NOT automatically unlock for free escape to the exits. (Or as directed by the Owner).

8. Upon loss of building power, all held doors remain secure. System is programmed for "fail-secure" mode in the event of power loss unless otherwise directed by the Owner.

H. Alarm monitoring workstations can be partitioned to completely control which workstation can access information and/or change information. All passcodes are provided by the Owner.

I. All transactions are annunciated, displayed, and recorded. The AC/FMS server relays alarm information to workstations as the user directs.

J. Supervision of initiating device circuits (wiring to readers, alarm monitor and alarm detectors) indicates alarm conditions at the controller(s) when attempts are made to compromise the system by bridging or wiring over alarm detectors or cutting initiating device circuit wiring.
   1. A communication failure indication (print-out, display and alarm) occurs at the controller(s) when a reader or alarm monitor does not respond with a message each time it is polled by its controller.
   2. A disabled reader or alarm monitor connection causes a printout showing the time, address and message indicating that device is disabled. A report is also made when the device is restored to normal.

K. System administration occurs through a graphical user interface. The software is user-oriented, with on-line help, instructional prompts and text descriptions.

L. The system supports an unlimited number of controllers that control an unlimited number of readers and monitors an unlimited number of alarm points.
   1. Controller supports a maximum of 16 readers or 16 devices.
   2. Controller operates in either local or remote configurations. A controller in a remote configuration has the ability to receive calls from the AC/FMS Server or call the AC/FMS Server in the event of an alarm condition via TCP/IP communication.

M. An internal clock allows for time scheduling.

N. The AC/FMS processes data from doors and maintains an active key base file of up to an unlimited number of individual keys/cards to an unlimited amount of issue levels.
   1. Automatically invalidates previous issue whenever a higher-level issue key is used in the system.

O. Each door has independent monitors or controls for alarm bypass, door status input, lock release input, and programmable door-open-too-long time. All monitor inputs are supervised.
P. The AC/FMS makes all decisions regarding access granted or denied. All pertinent data required to execute such decisions resides at the controller(s). Active key file, day types, access cycles, etc., are maintained at the AC/FMS Server and controllers.

1. A message buffer of at least 100,000 events automatically stores messages in the event communications are lost with the AC/FMS Server.

2. Controllers are reprogrammed from the AC/FMS server automatically in the event of power loss, telemetry interrupt or detection of program corruption during a routine central progress supervision cycle.

Q. The controller(s) are capable of controlling door unlock automatically by time schedule. The AC/FMS is programmable to allow implementation of the auto unlock condition immediately or only after the first valid card is presented at the door.

R. Anti-passback is available in all units.

1. Implementation is by program selection available to the user.

2. The user selects whether the anti-passback status is implemented upon a valid read or if it is implemented only after the AC/FMS recognizes that the door entry has been opened after the valid read.

3. Anti-passback status automatically resets at midnight daily and/or if an emergency unlock of all doors is implemented from a workstation.

S. Sequence of operation for each door opening shall be coordinated with the Owner.

1.5 SUBMITTALS

A. Submittals Package: Submit the three (3) sets of shop drawings, product data, and quality control submittals specified below at the same time as a package.

B. Shop Drawings:

1. Composite wiring and/or schematic diagrams of the complete system as proposed to be installed (standard diagrams will not be acceptable).
   a. Include transient surge and lightning protection grounding details for video signal circuits, control circuits, audio circuits, and ac power conductors.

2. Scale elevation drawings showing mounting of components.

3. Scale drawings of central monitoring console layout based on the supplied console drawings showing location and mounting of AC/FMS components.

C. Product Data:

1. Catalog sheets, specifications and installation instructions.

2. Bill of materials.

3. Detailed description of system operation (format similar to SYSTEM DESCRIPTION).

4. State number of inputs and outputs used specifically for this project and number of video inputs and outputs available for future use if system is expanded to maximum capacity.

5. Total electrical load of the complete system.
   a. Include for each system component that utilizes batteries the battery ampere-hour capacity recommended for each component by the Company producing the system, for the specified duration.

6. Statement from the Company producing the system, for each size and type of single conductor and multiconductor cable proposed for use, indicating that the electrical characteristics meet the requirements of the Company.

7. Name, address and telephone number of nearest fully equipped service organization.
D. Quality Control Submittals:
   1. Copy of applicable licensure as it relates to local, regional, and state law.
      a. Also include copy of identification card issued by the Licensee for each person who will
         be performing the work.
   2. Installer’s Qualifications Data: Include the following for each person who will be performing the
      Work:
      a. Name.
      b. Employer’s name, business address and telephone number.
      c. Name and addresses of the required number of similar projects worked on which meet the
         experience criteria.
      d. Current copy of manufacturer’s equipment certification for products supplied in this
         project.
   3. List of Completed Installations:
      a. For products from a Company which are specified by catalog number or description and
         are not viable or available at the time of the submittal process due to obsolesces or
         supersession, furnish the name, address and telephone number of at least 3 comparable
         installations which can prove the proposed products from the specified Company are the
         Company’s recommended replacements and have operated satisfactorily for one year.
   4. Outline of Onsite Training Programs Required:
      a. Provide a separate outline of the training programs to be used to train the maintenance and
         security personnel, including:
         1) System overview.
         2) System programming.
         3) Operation of system equipment.
         4) System maintenance.
         5) Estimated length (time) of each segment.
   5. Miscellaneous Documentation:
      a. Equipment factory certification document confirming the valid, in-effect manufacturer’s
         agreement indicating that the Contractor is an existing authorized and trained equipment
         installer for all the proposed equipment.
      b. Letter of agreement from the AC/FMS equipment manufacturer stating their on-site
         technical involvement for system setup, programming, and operator training.

E. Contract Closeout Submittals:
   1. System acceptance test report.
   2. Equipment settings chart for control equipment indicating controller module dip-switch settings,
      control equipment programming charts for each programmable component of the system.
   3. Operation and Maintenance Data:
      a. Deliver 2 hard copies, covering the installed products, to the Facility Representative.
         Provide 2 CD/Removeable Media (e.g., Flash Drive) Electronic files for the entire O&M
         manuals to include:
         1) Operation and maintenance data for each product.
         2) Equipment data sheets as submitted with any corrections on actual installed product.
         3) Complete point-to-point wiring diagrams of entire system as installed. Identify all
            conductors and show all terminations and splices. (Identification shall correspond to
            markers installed on each conductor.)
         4) Name, address, and telephone number of nearest fully equipped service organization.
1.6 QUALITY ASSURANCE

A. UL Listing: The system shall be listed in the UL Security Equipment Product Directory under product category “ALVY-Access Control System Units Section BP5721”.

B. Qualifications: The person(s) installing the Work of this Section and their supervisor shall be personally experienced and certified by the equipment manufacturer in access control/facility monitoring systems and shall have been engaged in the installation of access control/facility monitoring systems for a minimum of 3 years.
   1. Furnish the names and addresses of 5 similar projects which the foregoing people have worked on during the past 3 years.

C. The Company producing the system shall have a comprehensive online-learning program. Users shall be able to log onto the manufacturer’s web page and complete all technical training programs online at the student’s convenience. Students shall be able to obtain technical certification through a series of online tests. Training courses that must be available are:
   1. Field control panel and reader installation.
   2. System administrator training.
   4. Software installation training.
   5. Access vision video imaging & badge production training.

1.7 WARRANTIES

A. Manufacturer’s Warranty: Product and component specific manufacturer’s standard warranty.

B. Contractor shall respond to warranty service requests within 4 hours of initiation of call to the facility location.

1.8 MAINTENANCE

A. Service Availability: A fully equipped service organization capable of guaranteeing response time within 8 hours to service calls shall be available 24 hours a day, 7 days a week to service the on-going installation and the completed system.

B. Spare Parts:
   1. (3) Of each size fuse for boards and power supplies
   2. (2) Door position switches
   3. (2) Card readers
   4. (2) Request to exit devices
   5. (1) SA3032, (2) SA3000, (1) SA-SM88

PART 2 - PRODUCTS

2.1 ACCESS CONTROL SYSTEM - GENERAL

A. The AC/FMS system at the facility is an integrated portion of the main Transact System located at University of Maine primary campus @168 College Ave, Orono, ME.
   1. AC/FMS facility alarm monitoring workstations utilize Transact System software to integrate with and manage the Transact System.
B. Controllers make all necessary decisions and transfer the transaction record to the AC/FMS server.
   1. Controller communication consists of any combination of direct connect, IP address, and dial-up communication where required.

C. System is expandable to allow unlimited field panels, unlimited readers, and unlimited alarm points. (Limitations are only based on AC/FMS server capacity and number of controllers on the system.)
   1. The system is capable of supporting a remote building through the use of IP addresses LAN.

D. In the multi-station version of the system, the AC/FMS server located at University of Maine primary campus supports unlimited remote LAN connected facility workstations.
   1. LAN communications protocol is Microsoft NetBEUI or TCP/IP, operating over an Ethernet topology.
   2. All field panels are connected to the AC/FMS server through the University of Maine LAN/WAN.

2.2 ACCESS VISION SOFTWARE

A. Transact Access Control Software shall be provided and programmed by the Owner.

2.3 ACCESS CONTROL HARDWARE

A. Intelligent System Controller (ISC): Transact SA3032
   1. Features:
      a. Microprocessor-based, digital technology.
      b. Distributed intelligence architecture, with controllers operating independently of one another.
      c. All database information stored at the controller level.
      d. Houses the interface circuitry to communicate with the host system.
      e. All decision-making performed at the controller, eliminating degraded mode operation.
      f. ROM (field) that can be upgraded from AC/FMS server.
      g. Capable of receiving program instructions from the AC/FMS server, maintaining its program and executing decisions at the local door level.
      h. Capacity: Supports two downstream RS-485 2-wire ports that can be used to connect up to 16 devices (16 doors) in many combinations.
      i. Refer to the Contract Drawings for the quantity ISC within each ACP.

B. Input/Output Control Module (IOCM): Transact SA-SM88
   1. Provides eight configurable input control points and eight programmable output control relays that can be configured for fail-safe or fail-secure operation.
   2. Eight programmable output control relays rated at 1A/30VDC with 1A fuse for load switching.
   3. Supports normally open, normally closed, and non-supervised circuits.
   4. 24 VDC input power.
   5. RS-485 communication, multidropped (2-wire or 4-wire RS-485).
   6. On-board termination jumpers.
   7. Programmable addressing with 7-segment display.
   8. Status LEDs for communication to the host, heartbeat, and relay status.
   9. Up to eight IOCM can be used per ISC
   10. Refer to the Contract Drawings for the quantity of IOCM within each ACP.
C. Dual Reader Interface Module (DRIM): Transact SA3000
   1. Reader communications (Clock/Data and Wiegand)
   2. Five programmable output control relays rated at 1A/30VDC with a single 1A main fuse for load switching.
      a. One Alarm Relay
      b. One Auxiliary Relay
      c. One Bypass Relay
      d. One Lock Relay
      e. One Tamper Relay
   3. Seven input control points
      a. One Door Monitor Input
      b. One Request to Exit Input
      c. One Latch Monitor Input
      d. One Spare Input
      e. One Low Battery Input
      f. One AC Failure Input
      g. One Tamper Input
   4. 12 or 24VDC input power
   5. Supports up to two card readers for a single opening
   6. Reader Output Voltage: 12VDC
   7. Reader Output Current: 1A max (combined all readers)
   8. RS-485 communication, multidropped (2-wire or 4-wire RS-485).
   9. On-board termination jumpers
   10. Status LED support
   11. Refer to the Contract Drawings for the quantity of DRIM within each ACP.

D. Access Control Panel with Internal Power Supply and Battery Backup (ACP): LifeSafety Power 8DR-DVN-BLB or approved equal
   1. Monitoring, Control, and Reporting features to assess the following and report back to the AC/FMS server:
      a. Battery Health: Monitors battery charge/discharge level and can send an email if dead battery.
      b. Total System Health: Monitors and reports faults, output draw, battery state, and time to service.
      c. Output Condition: Monitors current draw, voltage level, and output status
      d. Power History: Monitors AC outages and generates site fault report
   2. Include fire alarm interface input trigger for connection from Fire Alarm Panel.
   3. Lockable cabinet with lockset and tamper switch included.
   4. Capable of battery backup with space for four 12Ah batteries.
   5. 12VDC batteries
   6. Accommodates up to eight Transact Access Control Modules (any combination of ISC, IOCM, and DRIM)
   7. Pre-wired 120VAC input with safe AC disconnect
   8. Removable knockouts on all four sides

E. Door Position Switch
   1. Door Position Switch (Recessed)
a. 3/4” recessed wide gap door contact  
b. UL listed  
c. Normally closed, SPST switch  
d. MagnaCare lifetime warranty  
e. Black in color  
f. Operation gap: Up to 3/4”  
g. Contact rating: 0.4A - 0.5A  
h. Securitron DPS-M-BK

F. Request to Exit Device  
1. Single or double door use  
2. Passive infrared detection  
3. SPDT relay  
4. Adjustable beam pattern  
5. Current Draw: 20-50mA  
6. Voltage: 12VDC to 28VDC  
7. Indicators: (1) activation LED  
8. Enclosure Dimensions: 1.75” x 7.00” x 1.87”  
9. Mounting Location: Wall  
10. Operating Temperature: 32°F to +110°F (0°C to +43°C)  
11. UL listed  
12. MagnaCare lifetime warranty  
13. White in color  
14. Assa Abloy XMS or approved equal

G. Hold-Up/Panic Button  
1. SPDT output  
2. Momentary switch  
3. Input Voltage: 12 to 24VAC/DC  
4. Current Rating: 4A at 24VDC  
5. Construction: Plastic with stainless steel finish  
6. Operating Temperature: -15°F to +120°F (-9°C to +49°C)  
7. Alarm Controls TS-18 or approved equal

H. Remote Door Release Button  
1. Momentary switch  
2. Current Rating: 0.75A at 125VDC  
3. Construction: Chrome-plated brass  
4. Alarm Controls MP-26 or approved equal

2.4 CARD ACCESS READERS

A. Transact DR5000 Readers. Mount to single gang plate with tamper-resistant screws.  
1. Furnished by the Owner, installed by the Contractor.  
2. For wall mounted or mullion-mounted applications (Subscript “M”)  
3. 6-16VDC Operation, 1.4W max  
4. Operating temperature: −31°F to +114°F (-35°C to +46°C)
5. 1.45” x 4.0” x 0.75” (3.68 x 10.2 x 1.91cm)
6. Maximum read range up to 1.5” (3.81cm) with NFC credential
7. Wiegand communication
8. Suitable for interior and exterior installation
9. UL294 listed
10. Audio/visual feedback upon credential read.
11. NFC DesFire encrypted credential and Transact Mobile Credential compatibility

B. The card reader shall be mounted on the wall or structure to in compliance with all American Disabilities Act (ADA); and local and federal laws as they apply to the installation. The reader should also be mounted at a height that is comfortable to use. In general, the reader is mounted such that the height of the sensor is between 48 and 54 inches above finished floor. Refer to Door Details for additional information.

2.5 ACCESS CONTROL CARD READER CREDENTIALS

A. The AC/FMS utilizes card products designed specifically for institutional applications.
B. Utilize existing NFC DesFire credentials or Transact Mobile Credential. Additional credentials shall be provided as necessary by the Owner.

2.6 POWER SUPPLIES AND BATTERY BACKUP

A. For Power to Intelligent System Controller: LifeSafety Power’s 8DR-DVN-BLB 8-door enclosure with 4A/24VDC power supplies and 12Ah backup batteries or approved equal.

2.7 ADDITIONAL ELECTRONIC DOOR HARDWARE

A. Refer to Specification Section 080671: Door Hardware Schedule and Specification Section 087100: Door Hardware for door hardware components specified outside the contents of this Specifications Section. Provide complete coordination with Door Hardware provider to ensure correct systems integration, locking functions, and compatibility.

2.8 COMMUNICATION CABLES

A. All electrical characteristics shall meet the requirements of the Company producing the system (attenuation, conductor to conductor capacitance, crosstalk, DC resistance, velocity of propagation, etc.). All cables within the buildings shall be plenum rated cable unless otherwise specified and approved.
B. Contractor shall refer to the Contract Drawings for specific cable sizes.
C. Cable types (NFPA 70 types CMP, CMR, and CMG) shall be selected in accordance with all applicable codes and regulations.
D. All conductors shall be twisted copper pair, shielded, and jacketed as recommended by the Company producing the system.
E. Other types of cables may be used in accordance with NFPA 70 Table 800.53 “Cable Uses and Permitted Substitutions”, as approved, if listed as being suitable for the purpose.
F. Outdoor Cables:
1. Provide cable as recommended by AC/FMS system manufacturer. Cable shall be flooded type with a high-density polyethylene jacket suitable for exterior use.

G. Indoor Cables:
   1. Signal Line Circuits (Wiring from Intelligent System Controller to Output Control Module, Dual Reader Interface Module, and Input Control Module [RS485 communication]): Jacketed, 24-gauge, insulated copper, (1) individually twisted pair, shielded; Belden Corp.’s 82842 cable or approved equal.
   2. Input Device Circuits (Wiring from Dual Reader Interface Module and Input Control Module to In-Field Input Device): Jacketed, 18-gauge, insulated copper, (1) individually twisted pair, shielded; Belden Corp.’s 6300FE cable or approved equal; or jacketed, 18-gauge, insulated copper, (2) individually twisted pairs, shielded; Belden Corp.’s 6302FE cable or approved equal as indicated in the Contract Drawings.
   3. Output Device Circuits (Wiring from Dual Reader Interface Module and Output Control Module to In-Field Output Device): Jacketed, 16-gauge, insulated copper, (1) individually twisted pair, shielded; Belden Corp.’s 6200FE cable or approved equal.
   4. Cabling to Card Readers: Jacketed, 18-gauge, insulated copper, (3) individually twisted pairs, shielded; Belden Corp.’s 6304FE cable.
   5. Grounding: Jacketed, 16-gauge, insulated copper, shielded; Belden Corp.’s 9980 cable or approved equal.
   6. Wiring shall be shielded or unshielded as recommended by the Company producing the system.
   7. Network category cabling provided by the Owner.
   8. All cable jacket colors as directed by the Owner.

2.9 CONNECTORS
   A. Connectors for Cables: As produced by Amphenol Corp. or approved equal (Weatherproof type where installed in exterior locations.)

2.10 WIRE-PULLING COMPOUNDS
   A. To suit type of insulation; American Polywater Corp.’s Polywater Series, Electric Products Div./3M’s WL, WLX, or WLW, Greenlee Textron Inc.’s Y-ER-EAS, Cable Cream, Cable Gel, Winter Gel, Ideal Industries Inc.’s Yellow 77, Aqua-Gel II, Agua-Gel CW, or Thomas & Betts Corp.’s Series 15-230 Cable Pulling Lubricants, or Series 15-631 Wire Slick.

2.11 SIGNS, LABELS, MARKERS, AND NAMEPLATES
   A. Station Locator: Flip type bound file, indexed with tabs and equipped with 8-1/2 x 11 inch (minimum) plans showing location of each card reader and location of all major equipment associated with the system. Enclose each plan in clear plastic envelope so that plans can be removed and updated.
   B. Wiring Diagram: Provide detailed One line diagram showing interconnection of all major components associated with the system within the Operation and Maintenance Manuals and As-Built wiring diagrams.
   C. Provide Nameplates: Precision engrave letters and numbers with uniform margins, character size minimum 3/16 inch high.
      1. Phenolic: Two color laminated engraver’s stock, 1/16 inch minimum thickness, machine engraved to expose inner core color (white).
      2. Aluminum: Standard aluminum alloy plate stock, minimum .032 inches thick, engraved areas enamel filled or background enameled with natural aluminum engraved characters.
3. Provide engraved nameplates for all equipment except card readers and door contacts.

D. Markers:
1. Premarked self-adhesive; W.H. Brady Co.’s B292, B708, Ideal Industries’ Mylar/Cloth wire markers, or Markwick Corp.’s permanent wire markers, Plastic Extruded Parts Inc.’s Flexible Sleeve or ID Band Markers, or Thomas and Betts Co.’s E-Z Code WSL self-laminating.
2. Other Styles: To suit application by W.H. Brady Co., Ideal Industries, Marwick Corp., Plastic Extruded Parts, Inc., or Thomas and Betts Co.

2.12 WIRE MANAGEMENT PRODUCTS

A. Cable Clamps and Clips, Cable Ties, Spiral Wraps, etc.: as manufactured by Catamount/T&B Corp., Ideal Industries Inc., or approved equal.

B. While in use covers for IP data outlets. Provide Thomas/Betts or approved equal clear covered “while in use” box covers with integral lock to secure the IP address outlets located in accessible locations.

2.13 ACCESSORIES

A. Include accessories required to perform the functions summarized in SYSTEM DESCRIPTION and indicated on the Contract Drawings.

2.14 SURGE SUPPRESSORS

A. ACP/Power Supply Power Circuit (120VAC) Surge Suppressor
1. AC hardwired transient voltage surge suppressor.
2. Single circuit.
3. UL, IEEE C62.41B listed.
5. 5 second installed, 1 second component level response time.
6. 120 VAC service voltage rated.
7. 22,500 amps surge current rated.
8. Operating Temperature: –40°F to +185°F (–40°C to +85°C).
9. 6,000,000 hours MTBF.
11. Model number: Ditek’s DTK-120HW or approved equal.
12. Shall be installed within 4” square junction box located at bottom of 120VAC wire way on access control equipment backboard.

B. Low-Voltage Access Control Device Surge Suppressor
1. Hardwired transient voltage surge suppressor.
2. UL497B listed.
3. Hardwired connection.
4. 24V service voltage rated.
5. 20,000 amps surge current rated.
6. Operating Temperature: –40°F to +158°F (–40°C to +70°C).
7. Model number: Ditek’s DTK-2MHLP24BWB or approved equal.
8. Shall be provided for outdoor access control components except card readers.

C. Card Reader Surge Suppressor
1. Hardwired transient voltage surge protector.
2. UL497B listed.
3. Hardwired connection.
4. 24V service voltage rated.
5. 20,000 amps surge current rated.
6. Operating Temperature: -40°F to +158°F (-40°C to +70°C).
7. Model number: Ditek’s DTK-4LVLP-CR or approved equal.
8. Shall be provided for outdoor card access readers.

PART 3 - EXECUTION

3.1 INTERRUPTIONS TO EXISTING ACCESS CONTROL/DOOR MONITORING SYSTEM

A. Maintain the existing system in its present condition to the extent possible while installing new Work. Existing system at no time shall be rendered inoperable without the expressed written consent of the Owner. Only existing systems that are malfunctioning and causing delays in the installation of the new system will be considered for disconnection prior to the new system acceptance testing unless otherwise indicated on the Contract Drawings.

B. When changes or removals are required to the existing AC/FMS system such that its ability to act as an AC/FMS system is impaired, provide a temporary wireless AC/FMS system so that each area is covered at all times by a functioning system. Notify the Owner of proposed temporary measures and scheduling. Both the proposed temporary measures and the scheduling must be approved by the Owner.

3.2 INSTALLATION

A. Install system in accordance with the Company’s printed instructions unless otherwise indicated.
   1. Coordinate with the Owner for placement of the controllers in secured locations as shown on the Contract Drawings. Detail and configure the system to specific site conditions with the Owner’s assistance and approval.
   2. Contact the FICC and coordinate all equipment IP addresses and equipment location for any components located in or connected to the facility data network and data rooms.

B. Wiring:
   1. Install conductors in raceways after the raceway system is completed. Exception: Conductor types specifically indicated on the Contract Drawings not to be installed in raceways.
      a. No grease, oil, or lubricant other than wire-pulling compounds specified may be used to facilitate the installation of conductors.
   2. Connect system components requiring a primary power supply to dedicated branch circuits.
   3. Make connections and splices at system components, AC/FMS interconnection cabinets, terminal strip cabinets, and console only. Connections or splices will not be allowed at any other location in the system.
   4. Use wire management products to bundle, route, and support wiring in junction boxes, pull boxes, wireways, gutters, channels, and other locations where wiring is accessible.

C. Mounting Hardware:
   1. Mount all exposed equipment with security-grade, tamper-resistant, center-pin reject style Allen type mounting screws.
D. Surge Suppressors:
   1. Install surge suppressors on each conductor entering and leaving console from outdoor components.
   2. Ground the suppressors per NFPA 70 and manufacturer requirements.
   3. Install surge suppressors for 120VAC input circuits prior to connections to power supplies.
   4. Install suppressors within power supply cabinet or separate NEMA enclosure as recommended by manufacturer.

E. Earth ground of equipment as required by equipment manufacturer.
   1. Do not use telephone ground connections as earth grounds.
   2. Do not use connections to building structural steel as earth grounds.
   3. Provide equipment-grounding conductors supplied from an established earth ground source or from a grounding bus in a panelboard.

F. Identification, Labeling, Marking:
   1. Station Locators: Install adjacent to each workstation.
   2. Wiring Diagram: Install adjacent to equipment in 1st floor I.T. Room 109C.
   3. Nameplates:
      a. Install lacamoid engraved nameplate with card reader designation over each card reader.
      b. Install nameplate with monitor designation over each monitor.
   4. Identification of Circuits: Identify wires and cables by system and function in cabinets with premarked, self-adhesive, wraparound type markers. Designations shall correspond with point to point wiring diagrams.
   5. Battery Data: Insert a copy of the battery warranty in each battery compartment and mark on batteries the date placed in service.

3.3 FIELD QUALITY CONTROL

A. Cable Test: Electronically meter, test, and document all cables, control wiring, and twisted cables prior to installing new equipment. Test for opens, grounds, and shorts.

B. Make corrections to wiring prior to proceeding. Advise the Owner of any cable that cannot be repaired.

C. Provide written test results for all cables and certify operation.

D. Test all cables after installation and prior to connecting new equipment.

E. Preliminary System Test:
   1. Preparation: Adjust the completed system and then operate it long enough to assure that it is performing properly:
   2. Run a preliminary test for the purpose of:
      a. Determining whether the system is in suitable condition to conduct the acceptance test.
      b. Checking and adjusting equipment.
      c. Training facility personnel.
      d. Test each system function step by step as summarized under system description.
      e. Test audible alarm.

F. System Acceptance Test:
   1. Preparation: Notify the Owner at least 3 working days prior to the test so arrangements can be made to have a Facility Representative witness the test.
2. Supply equipment necessary for system adjustment and testing.
3. Make the following tests:
   a. Test all software. Demonstrate that all features of the software are operable.
   b. Test each system function step by step as summarized under SYSTEM DESCRIPTION.
   c. Individually test each door (card access and monitoring).
4. Submit written report of test results signed by the Owner. Mount a copy of the final report in a Plexiglas enclosed frame assembly adjacent to the central controller.

3.4 INSULATED CONDUCTOR SCHEDULE – TYPES AND USE

   A. Communication Circuits:
      1. For interior wiring (in raceways), use communication and power cable types specified in PART 2.
      2. Where wiring is specifically indicated on the Contract Drawings not to be run in raceway use plenum rated cable (concealed unless otherwise indicated).

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 1 Specification Sections apply to this Section.

1.2 DESCRIPTION
A. Extent of addressable fire alarm and detection systems work is indicated by the Drawings and Schedules.
B. Types of addressable fire alarm and detection systems in this section include the following:
   1. Combination, Non-Coded, Addressable.

1.3 QUALITY ASSURANCE
A. Manufacturers: Firms regularly engaged in manufacture of addressable fire alarm and detection systems, of types, sizes, and electrical characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
B. Installer: Qualified with at least 5 years of successful installation experience on projects with addressable fire alarm and detection system installation work similar to that provided for project.
C. NEC Compliance: Comply with NEC as applicable to installation and construction of addressable fire alarm and detection system components and accessories.
D. UL Compliance and Labeling: Provide addressable fire alarm and detection system components which are UL-listed and labeled.

1.4 SUBMITTALS
A. Product Data: Submit manufacturer's data on addressable fire alarm and detection systems including, but not limited to, roughing-in diagrams and instructions for installation, operations, and maintenance suitable for inclusion in maintenance manuals. Also include project specific riser diagram, device cut sheets, device wiring diagrams, and notification appliance circuits (NAC) load and voltage drop calculations.
B. Include data in operation and maintenance manuals per Section 260007.

PART 2 – PRODUCTS

2.1 ADDRESSABLE FIRE ALARM AND DETECTION SYSTEMS
A. General: Noncoded, addressable, microprocessor based type system with manual and automatic alarm initiation, analog addressable smoke detectors.
B. Functional Description: Provide a complete addressable fire alarm and detection system with the following functions and operating features:

1. Priority of Signals: Automatic response functions shall be accomplished by the first address initiated. Alarm functions resulting from initiation by the first address shall not be altered by subsequent alarms. An alarm signal shall be the highest priority. Supervisory or trouble signals shall have second- and third-level priority. Signals of a higher level priority shall take precedence over signals of lower priority even though the lower priority condition occurred first. Annunciate all alarm signals regardless of priority or order received.

2. Noninterfering: Provide addressable, powered, wired, and supervised system so a signal on one address does not prevent the receipt of signals from any other address. All devices shall be manually resettable from the FACP after the initiating device or devices have been restored to normal. Systems that require the use of batteries or battery backup for the programming function are not acceptable.

3. Signal Initiation: The manual or automatic operation of an alarm initiating or supervisory operating device shall cause the FACP to transmit an appropriate signal including:
   a. General alarm.
   b. Smoke detector alarm.
   c. CO detector alarm
   d. System trouble.
   e. Fan shutdown.

4. Silencing at FACP: Switches shall provide capability for acknowledgment of alarm; supervisory, trouble, and other specified signals at the FACP; and capability to silence the local audible signal and light an LED (light emitting diode). Subsequent alarms shall cause the audible signal to sound again until silenced in turn by switch operation. Restoration to normal of alarm, supervisory, and trouble conditions shall extinguish the associated LED and cause the audible signal to sound again until the restoration is acknowledged by switch operation.

5. Power Loss Indication: Sound trouble signal at the FACP upon loss of primary power at the FACP and the annunciator. Illuminate the emergency power light at both locations when the system is operating on an alternate power supply.

6. Annunciation: Annunciate manual or automatic operation of any alarm or supervisory initiating device both on the FACP and on the remote annunciator indicating the location and type device.

7. General Alarm: A system general alarm includes:
   a. Indicating the general alarm condition at the FACP and the system annunciator.
   b. Identifying the device that is the source of the alarm (or its zone) at the FACP and the system annunciator.
   c. Initiating audible and visible alarm signals throughout the building.
   d. Stopping supply and return fans.
   e. Closing smoke dampers on system.
   f. Initiating smoke control sequence through a signal to the building automatic temperature control system.
   g. Initiating transmission of alarm signal to remote central station.

8. Manual station alarm operation initiates a general alarm.

9. Smoke detection initiates a general alarm.

10. CO detection initiates a separate alarm tone and transmits a separate alarm signal to Central Monitoring station, indicating CO detection.

11. Sprinkler system water flow is to initiate a general alarm.

12. Sprinkler system tamper switch initiation is to initiate a trouble signal.
13. Permissible Signal Time Elapse: The maximum permissible elapsed time between the actuation of any fire alarm or fire detection system alarm initiating device and its indication at the FACP is ten seconds.

14. Circuit Supervision: Indicate circuit faults with both a zone and a trouble signal at the FACP. Provide a distinctive indicating audible tone and (LED) indicating light. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.

C. Extra Materials:
1. General: Furnish extra materials matching products installed, as described below, packaged with protective covering for storage, and identified with labels clearly describing contents.
2. Lamps for Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.
3. Smoke Detectors, and Heat Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.
4. Detector Bases: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.

D. Manufacturers: Campus Standard - Gamewell-FCI by Honeywell Materials and Equipment:
1. Manual Pull Stations:
   a. General: Double-action type, fabricated of metal or polycarbonate, and finished in red with molded raised letter operating instructions of contrasting color. Stations requiring the breaking of glass are not acceptable.
   b. Reset: Key-or wrench-operated reset station switch, double pole, double throw, and rated for the voltage and current at which they operate. Provide stations with screw terminals for connections.
   c. Addressability: Provide pull stations with a communication transmitter and receiver having a unique identification and status reporting capability to the FACP.
   d. Provide on each manual pull station a clear cover with built-in annunciator similar to STI #STI-1100, for flush mounted pull stations and STI #STI-1130 for surface mounted pull stations.
2. Combination Photoelectric Smoke and CO Detectors:
   a. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Provide the following features:
   b. Photoelectric Detector Sensitivity: Between 2.5 and 3.5 percent per foot smoke obscuration when tested in accordance with UL 268.
   c. The detector shall be comprised of four sensing elements, including a photoelectric (light scattering) particulate sensor, an electrochemical CO sensor.
   d. Factory Nameplate: With serial number and type identification.
   e. Operating Voltage: 24-V d.c., nominal.
   f. Self-Restoring: Provide detectors that do not require resetting or readjustment after actuation to restore them to normal operation.
   g. Plug-in Arrangement: Detector and associated encapsulated electronic components mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection shall require no springs for secure mounting and contact maintenance. Provide terminals in the fixed base for building wiring.
   h. Visual Indicator: Connected to indicate detector has operated.
   i. Addressability: Provide detectors with a communication transmitter and receiver having a unique identification and status reporting capability to the FACP.
3. Addressable Thermal Detector: Rate compensated/ fixed temperature type with plug-in base and alarm indication lamp. Provide detectors with a communication transmitter and receiver complete having a unique identification and status-reporting capability to the FACP.

4. Addressable Duct Detectors: Provide Detectors which are of the intelligent photoelectric type in a duct housing with sampling tubes, remote indicator with keyed remote test and reset, and provide continuous analog monitoring of the unit's sensitivity and alarm verification from the FACP. Detectors shall be UL 268A listed, 24 VDC, rated for air velocities from 300 to 4000 feet per minute, having two Form-C auxiliary contacts, and have powered outputs for remote LED indicators.

5. Alarm Indicating Devices:
   a. General: Equip alarm indicating devices for mounting as indicated. Provide terminal blocks for system connections.
   b. Addressable Interface Units: Unit designed to monitor system component not equipped for multiplex communication with FACP and transmit identification and status to that terminal. Provide units with a communication transmitter and receiver complete having a unique identification and status-reporting capability to the FACP.

6. Visual Alarm Signals: White, 24-V d.c. strobe lights utilizing high-intensity, white or clear, optic lens, and xenon flash tube. Provide the word "FIRE" engraved in minimum 1-inch high letters displayed on the unit. Provide units with field selectable candela output of 15, 15/75, 30, 75, 110 candela via unit mounted dip switches. Units are to have a constant 1 Hertz flash rate regardless of input voltage. Comply with strobe intensity and location regulations per the latest recognized standard CABO/ANSI A117.1.

7. Combination Signals: Provide White factory-combined audible and visible alarm units which meet the requirements of the individual horn and visual unit specifications into a single mounting unit where indicated.

E. Fire Alarm Control Panel (FACP):
   2. Cabinet: Lockable steel enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Provide cabinets large enough to accommodate all components and to allow ample gutter space for interconnection of panels as well as field wiring. Identify each enclosure and each component by an engraved red laminated phenolic resin nameplate. Lettering on the enclosure nameplate shall not be less than 1 inch high. Identify individual components and modules within the cabinets by engraved laminated phenolic resin nameplates.
   4. Control Modules: Types and capacities to perform all functions of the fire alarm system. Provide local, visible, and audible signals to notify of any alarm, supervisory, and trouble condition. Provide each type of audible alarm with a distinctly different sound.
   5. Zones: Make provision in the FACP for all alarm and supervisory zones indicated. Provide an addressable module for each of the existing zones in the existing building fire alarm system and connect into this new addressable fire alarm system.
   6. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm or trouble condition on the system still exists.
   7. Alphanumeric Display and System Controls: Arrange to provide the basic interface between human operator at FACP and addressable system components, including annunciation and supervision. Provide a display with a minimum of 32 characters, arranged to display alarm, supervisory, and component status messages.
8. Visual signal module: Provide visual signal synchronization module(s) in the FACP to synchronize all strobes. Provide a third synchronization wire from this module(s) to each visual signal strobe.

9. Instructions: Provide a typeset, printed, or typewritten instruction card mounted behind a lexan plastic or glass cover in a stainless steel or aluminum frame. Install the frame in a location observable from the FACP. Describe steps to be taken by an operator when a signal is received as well as the functional operation of the system under all conditions: normal, alarm, and trouble. Obtain approval for instructions before mounting.

F. Remote Annunciator:
   1. General: Provide remote annunciator with minimum 32-character alphanumeric Liquid Crystal Display (LCD) and 5 LEDs identical to display in Fire Alarm Control Panel. Annunciator to mimic display in FACP. All alarm, trouble, and status information shall be accessible through the remote annunciator keypad with proper password.

G. Emergency Power Supply:
   1. General: Components include battery, charger, and an automatic transfer switch.
   2. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the batteries shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 15 minutes.
   3. Magnetic door holders shall not be served by emergency power. Magnetic door holders shall be released on the failure of primary power.
   4. Automatic Transfer Switch: Transfer the load to the battery without loss of signals or status indications in the event of the failure of primary power.
   5. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide for 150 percent of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged, the charger shall recharge them fully within 4 hours. Charger output shall be supervised as part of system power supply supervision.

H. Commercial Cellular / IP Fire Alarm Communicator:
   1. Provide UL listed and NFPA 72 compliant wireless Commercial alarm communicator Starlink #SLE-LTEVI-CFB

I. Wiring Methods:
   1. Conduit and Conductors: All cables for fire alarm, security, and signaling systems shall be riser-rated and shall be listed 2 hour electrical circuit protective system. Emergency communications cables shall be Type CMR-CI or shall be riser rated and shall be listed 2 hour electrical circuit protective system. Provide complete wiring and conduit between all equipment. Unless otherwise specified within the Installation Manual of the specific equipment being used, all field wiring shall be minimum #16 (solid) or #14 (stranded) copper conductors, installed in separate conduit, maximum 40 percent full, and shall be approved for use as fire alarm cable. All NACs shall be loaded no greater than 70 percent of full load. The maximum voltage drop allowable for NAC calculation is 10 percent. Audible and Visible signals shall be wired on separate circuits. Conduit of proper size shall be installed from the Control Panel: Equipment to field devices.
   2. All field devices shall be mounted upon UL listed electrical junction boxes.
   3. All splices in field wiring shall be made in UL listed electrical junction boxes.
   4. All Fire Alarm electrical junction box covers shall be labeled as "Fire Alarm Wiring Authorized Personnel Only” with adhesive backed decal. Decal shall indicate both the number and the type of circuit the junction box contains. The Fire Alarm/Life Safety
Installation shall comply fully with all local, State and National Codes, and the local authority having jurisdiction.

5. Conduit shall enter into the Fire Alarm control panel backbox only at those areas of the backbox which have factory conduit knockouts.

6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnect standby battery, removal of any internal modules, or any open circuits in the field wiring; an audible and visual trouble signal will be activated until the system and its associate field wiring are restored to normal condition.

7. Open cable shall be allowed above ceilings, in attics and in other areas allowing surface wiring if so approved by the Local Authority Having Jurisdiction. All cable shall be protected where entering or leaving a junction box or device box with a portable cord straight grip connector such as Bridgeport #770-4 or equal.

8. Cable shall be the type listed for Fire Alarm/Life Safety use and shall be installed per NEC Article 760.

9. Cable must be separated from any open conductors of power, or class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.

10. All exposed cable below 84 inches from the surface of the finished floor, or to other locations where the cable may become exposed and/or damaged, must be within a steel conduit.

11. Conduits must also be provided in elevator shafts and hoistways. Cables within ducts or plenums must conform with the specifications of NEC Article 300-22.

J. Riser and wiring diagrams prepared by engineer are not intended as final installation drawings but only as a guide for bidding. Install system based on final wiring drawings prepared by the manufacturer of the system.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install addressable fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instruction, and complying with applicable portions of NEC, and NECA's "Standard of Installation."

B. Manual Pull Stations: Unless otherwise indicated mount semi-flush in recessed back boxes with operating handles 48 inches above finished floor.

C. Smoke Detectors: Install detectors indicated to be ceiling mounted not less than 4 inches from a side wall to the near edge. Install detectors located on the wall at least 4 inches but not more than 12 inches below the ceiling. For exposed solid joist construction, mount detectors on the bottoms of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction. Install detectors no closer than 5 feet from air registers.

D. Audible Alarm Indicating Devices: at 80" aff to bottom of unit. Unless otherwise indicated, install horns on flush mounted back boxes with the device operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

E. Visual Alarm Indicating Devices: Install adjacent to each alarm bell or alarm horn. Install at 80" aff to bottom of unit.

F. Fire Alarm Control Panel (FACP): Surface mount with tops of cabinets not more than 6 feet above the finished floor.
3.2 INSTALLATION OF BASIC IDENTIFICATION

A. Install electrical identification in accordance with Division 26 Basic Materials and Methods Section "Electrical Identification."

B. Provide adhesive backed label on cover of panelboard indicating "Fire Alarm System Power Source" Label shall also indicate circuit number. On interior of panelboard provide adhesive label indicating position of branch circuit with arrow point to breaker serving fire alarm control panel.

3.3 INSTALLATION OF BASIC WIRING SYSTEM MATERIALS

A. Install wiring, raceways, and electrical boxes and fittings in accordance with Division 26 Basic Materials and Methods Sections "Raceways," "Wires and Cables," and "Electrical Boxes and Fittings."

B. Install fire-stopping products for all open cables runs through fire-rated construction as specified in Section "Basic Electrical Requirements."

3.4 FIELD QUALITY CONTROL

A. Inspect relays and signals for malfunctioning, and where necessary, adjust units for proper operation to fulfill project requirements.

B. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of fire alarm and detection system equipment.

C. Provide three service organization inspections for each system at four-month intervals during the year following final acceptance. Correct defects found in the system at the time of these inspections.

D. The contractor must retain the services of the fire alarm system manufacturer for the following minimum requirements:

E. To perform and assist the electrical contractor in the installation of the fire alarm system.
   1. Perform testing of all devices (pull stations, smoke and heat detectors and A/V units, etc.) for alarm, supervision, and trouble conditions.
   2. Provide two 4-hour training sessions (separate days) dedicated to training the owner in the complete operation and maintenance of all system components and control panel.
   3. Provide testing reports indicating each device tested and consistent with NFPA 72.
   4. Perform acceptance testing with the authority having jurisdiction.
   5. And any other functions deemed necessary.

F. The contractor shall provide full testing of the system including the following:
   1. The testing of the system shall be in accordance with the procedures outlined in NFPA 72, including System Reacceptance Testing, for existing software functions and devices. Testing of smoke detectors shall be with smoke or listed aerosol approved by the detector manufacturer.
   2. Retest the system until all deficiencies have been rectified.
   3. The contractor shall submit a written test report signed by the manufacturer's representative indicating that the fire alarm system has been 100 percent tested and approved prior to the acceptance test.
   4. The contractor shall conduct an acceptance test of every component required in the presence of the Owner, Owner's representatives, and the authority having jurisdiction.
5. Rectify all deficiencies identified at the acceptance test at no cost to the owner and reschedule a retest of the system

G. Provide complete operating and maintenance instructions for the system as installed.

END OF SECTION