PROJECT MANUAL

Wallowa Memorial Hospital
MRI Breezeway

601 Medical Pkwy
Enterprise, OR 97828

Construction Documents
January 31, 2025

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification of project team members and their contact information.

1.02 OWNER:

A. Wallowa Memorial Hospital
601 Medical Parkway
Enterprise, OR 97828
(541) 426-5400

B. Primary Contact: All correspondence from the Contractor to the Architect will be direct, with copies to this party, unless alternate arrangements are mutually agreed upon at preconstruction meeting.
1. Owner's representative.

1.03 ARCHITECT:

A. Architect: Clark Kjos Architects
621 SW Alder St, Suite 700
Portland, OR 97205
(503) 224-4848

1.04 ARCHITECTS CONSULTANTS:

A. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through Architect, unless alternate arrangements are mutually agreed upon at preconstruction meeting.

B. Structural Engineering Consultant:
Devco Engineering Inc
245 NE Conifer Blvd
Corvallis, OR 97330
(541) 757-8991

C. Mechanical / Electrical Engineering Consultant:
MFIA Inc..
2007 SE Ash St.
Portland, OR 97214
(503) 234-0548

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

PROCUREMENT AND CONTRACTING REQUIREMENTS

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

B. Infection Control Risk Assessment:
   1. Owner requirements for infection control procedures to be followed by Contractor during construction.
   2. Infection Control Risk Assessment available from owner upon request.

1.02 PRELIMINARY DATA

A. Certain preliminary investigations and studies made by the Owner are available to the bidders but will not be part of Contract Documents, as follows:

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

3.01 OBTAINMENT OF PERMITS

A. Permits to be obtained by the following methods:
   1. Contractor to obtain the following required permits, and submit as a reimbursable expense to the Owner:
      a. All Building Permits for all trades.
      b. All Delegated Design submittals (if applicable).

B. Building Permit Procedures: When required to obtain this permit:
   1. Complete and file permit application(s) with appropriate agency.
   2. Pay required fees.
   3. Advise Architect if submission of modified documents is necessary to have the authorities having jurisdiction complete the plan review and approval process. Submit modified documents expeditiously.
   4. Do not commence execution of any item of work for which a permit has not been obtained.

TO: CLARK // KJOS ARCHITECTS, 621 SW ALDER ST., SUITE 700, PORTLAND, OR 97205

PROJECT: _____

WE HEREBY SUBMIT FOR YOUR CONSIDERATION THE FOLLOWING PRODUCT INSTEAD OF THE SPECIFIED ITEM FOR THE ABOVE PROJECT:

SECTION		PARAGRAPH		SPECIFIED ITEM

PROPOSED SUBSTITUTION: _____

FILL IN BLANKS BELOW:

A. DOES THE SUBSTITUTION AFFECT DIMENSIONS SHOWN ON DRAWINGS? _____

B. WILL THE UNDERSIGNED PAY FOR CHANGES TO THE BUILDING DESIGN INCLUDING ENGINEERING AND DETAILING COSTS CAUSED BY THE REQUESTED SUBSTITUTION? _____

C. WHAT EFFECT DOES SUBSTITUTION HAVE ON OTHER TRADES? _____

D. DIFFERENCES BETWEEN PROPOSED SUBSTITUTION AND SPECIFIED ITEM? _____

E. MANUFACTURER'S GUARANTEES OF THE PROPOSED AND SPECIFIED ITEMS ARE:

_____SAME _____ DIFFERENT (EXPLAIN ON ATTACHMENT)

F. ROLE OF SUBMITTER: ___GENERAL CONTRACTOR ___SUBCONTRACTOR ___MANUFACTURER___DISTRIBUTOR ___ REPRESENTATIVE

G. ATTACH COMPLETE TECHNICAL DATA, INCLUDING LABORATORY TESTS, IF APPLICABLE.

H. INCLUDE COMPLETE INFORMATION ON CHANGES TO DRAWINGS AND/OR SPECIFICATIONS WHICH PROPOSED SUBSTITUTION WILL REQUIRE FOR ITS PROPER INSTALLATION.

I. THE UNDERSIGNED STATES THAT THE FUNCTION, APPEARANCE AND QUALITY ARE EQUIVALENT OR SUPERIOR TO THE SPECIFIED ITEM.

J. THE UNDERSIGNED AGREES THAT THE TERMS AND CONDITIONS FOR SUBSTITUTIONS FOUND IN THE BIDDING DOCUMENTS APPLY TO THIS PROPOSED SUBSTITUTION.

SUBMITTED BY:

SIGNATURE _____

FIRM _____

ADDRESS_____

_____

DATE_____

TELEPHONE _____

EMAIL _____

FOR USE BY DESIGN CONSULTANT:

___ACCEPTED ___ACCEPTED AS NOTED

___NOT ACCEPTED___RECEIVED TOO LATE

BY _____

REMARKS_____

_____

_____

PART 1 GENERAL

1.01 PROJECT

A. Project Name: WMH-MRI Breezeway

B. Owner's Name: Wallowa Memorial Hospital.

C. Architect's Name: Clark Kjos Architects.

1.02 DESCRIPTION OF ALTERATIONS WORK

A. Replacement of mobile MRI semi-trailer with prefabricated MRI modular building and new enclosed walkway to connect the MRI to the existing hospital building. This includes minor demolition at the existing building envelope.

B. Scope of demolition and removal work is indicated on drawings and specified in Section 02 41 00.

1.03 WORK BY OWNER

A. Owner will supply and install items as listed on equipment schedule in drawings.

1.04 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:
   1. Work by Others.
   2. Use of site and premises by the public.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Utility Outages and Shutdown:
   1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   2. Minimize shutdown of utility services and arrange at least 24 hours in advance with Owner.
   3. Prevent accidental disruption of utility services to other facilities.

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 00 31 00 - Available Project Information: Infection Control Risk Assessment report.

B. Section 01 30 00 - Administrative Requirements: Preconstruction Meeting for review of project procedures related to the requirements of this section.

1.02 PROJECT PROCEDURES

A. Infection Control Risk Assessment (ICRA):
   1. The Owner shall prepare an Infection Control Risk Assessment (ICRA) prior to start of construction and shall develop a dust control plan based upon that assessment.
   2. The Contractor and Owner's Representative shall monitor jobsite conditions per the dust control plan and the ICRA.

B. Examination of Existing Site With Owner's Representative:
   1. Examine existing equipment, building, and site with Owner's Representative to determine existing conditions.
   2. Owner's Representative will record existing damaged surfaces, equipment, and systems.
   3. Upon completion of work, Contractor and Owner's Representative will examine equipment, building, and site.
   4. Repair damage to site improvements, building, and equipment caused by construction activity and not recorded during original examination.

C. Examination Prior to Alteration Work:
   1. Examine existing equipment, building, and site.
   2. Report concealed utility lines, unrecorded structural support, and material relationships not indicated on Drawings to Architect prior to starting work.
   3. Report presence of hazardous materials to Architect and Owner.

D. Scheduling and Stopping Work for Hospital Procedures:
   1. Schedule selective demolition and equipment removal for minimum disruption of Hospital operation procedures.
   2. Work may be stopped by Hospital personnel at any time because of Hospital operation procedures.

E. Protection:
   1. Provide protection for adjacent surfaces, Owner occupied areas, utility lines, and structural members which may be damaged by Work.
   2. Protect concealed conduit, pipe, and duct lines uncovered by removal of existing materials and systems.
   3. Protect exposed surfaces of areas outside the defined project scope of work area during hauling and storage of materials.
   4. Protect and maintain existing fire protection, fire and smoke detectors, and enunciation systems in operational condition.
   5. Protect life safety systems with dust proof enclosures when in presence of air born dust.
   6. Protect existing paving, walk, and landscape surfaces during loading/unloading, hauling and construction activities.

F. Reuse of Existing Material and Equipment:
   1. Except where specifically indicated or specified, do not use material and equipment removed from existing structure in completed Work.
   2. For material and equipment indicated to be reused in Work, use care in removing, handling, restoring, storing, and reinstalling to assure acceptable function and appearance in completed work.

G. Finishing Adjacent to Existing Surfaces:
   1. Patch finished surfaces in renovated areas to match existing adjacent finish.

2. Select materials and finish textures and colors to match existing adjacent finished surfaces.
3. Refinish complete wall, ceiling, and trim surfaces to align with physical breaks in the existing finished surfaces.

H. Temporary Shut Off of Hospital Utility and Life Safety Systems:
1. Coordinate shut off of medical gas and utility supply lines with Owner's Representative.
2. Provide 3 days notice prior to shut off of medical gas lines.
3. Provide 1 day notice prior to shut off of water supply and waste water lines.
4. Provide 1 day notice prior to shut off of vacuum system.
5. Provide 1 day notice prior to shut off of HVAC systems.
6. Obtain Owner's approval prior to shut off of life safety systems including fire protection, fire and smoke detectors, and enunciation systems for short periods of time when work may cause false alarms.
7. Reactivate and confirm life safety systems operational at end of work which may cause false alarms or at end of each work day, which ever comes first.

1.03 DUST CONTROL PROCEDURES

A. Control of Dust: Erect barriers, vapor retarders and implement air pressure control procedures to manage and control dust and dust-borne pathogens generated by project work.
1. Dust: Aspergillus has been detected in dust that is generated during renovation or construction projects in hospitals. Exposure to this dust can cause severe illness in major surgery patients and other immuno-compromised patients.
2. Limit exposure: Reasonably limit exposure to dust from construction activities to all patients, staff and visitors.

B. Coordination: Coordinate with project personnel and Owner's Representative. Determine when a dust enclosure is required to isolate the construction area from adjacent areas.
1. Identify the appropriate type of barrier.
2. Confirm the need for negative air pressure.
3. Identify the boundary of the work area on the construction documents.
4. Coordinate with the Owner's Representative for periodic cleaning beyond required broom cleaning by contractor personnel.
5. Monitor the area for compliance.

C. Barriers:
1. Provide complete air barriers and vapor retarders between finished areas and areas of construction activity which will modify the air quality and moisture content.
a. Extend barrier from floor to ceiling.
b. When work is being done above the ceiling extend the barrier from floor to structure.
2. Seal all penetrations through the enclosure around the edges using tape, foam or other materials that form a positive seal.
3. Maintain seal around enclosure entrance and exit when not being used for entry or exit.

D. Air Pressure:
1. Provide negative air pressure inside the enclosure when required by the Owner's Representative.
a. Block air supply systems.
b. Provide a fan vented to the outside of the building and away from building air intakes, or adjacent operable windows. In lieu of fan vented as described above, Contractor shall provide a fan with a High Efficiency Particulate Air (HEPA) filter vented outside the enclosure.

E. Other Requirements:
1. Provide Sticky-Back (walk-off) mats or dampened walk mats inside and outside the entrance and exit to the enclosure. Personnel to brush loose dust from shoes and clothing before exiting the enclosure. Replace mats as needed to prevent dust tracking outside the enclosure.

2. Remove any dust tracked outside the enclosure immediately with a HEPA vacuum, damp mop, or other appropriate means.
3. Transport all materials, tools, equipment, debris, etc. to and from the enclosure in containers with tight fitting lids. Coordinate routes with Owner's Representative.
4. Monitor employees and subcontractors for compliance.

1.04 INTERIM LIFE-SAFETY PROCEDURES

A. At the start of the project, the Owner's Representative and the Contractor shall jointly develop an Interim Life-Safety Measure Plan.
   1. No on-site work shall commence until the Interim Life-Safety Measure Plan has been developed and accepted by both the Owner's Representative and the Contractor in writing.
   2. The Interim Life-Safety Measure Plan shall comply with all applicable codes and any additional requirements of the Authorities Having Jurisdiction.

B. The Owner's Representative will interpret the Interim Life-Safety Measures and determine the standard(s) to be applied and frequency of monitoring.

C. Coordinate with Owner's Representative in implementation and monitoring of the required Interim Life Safety Measures when required by any of the conditions listed below.

D. Interim Life-Safety Measures are required as follows:
   1. Exits: When the exit access, exit way or exit discharge features are changed.
      a. Notify the Owner's Representative when exiting is to be changed.
      b. Refer to Oregon Structural Specialty Code (OSSC) current edition for definitions of exit access, exit way, exit discharge and other exit system components.
   2. Barriers: When the building's "defend-in-place" compartmentalization features (fire barriers, smoke barriers, floor slabs, corridor walls etc.) will be significantly compromised.
      a. Notify the Owner's Representative when the building's "defend-in-place" compartmentalization will be changed.
      b. Refer to Oregon Structural Specialty Code (OSSC) current edition for definitions of fire barriers, smoke barriers, corridors, etc.
   3. Fire Systems: When the building's fire alarm, fire detection or fire suppression systems are impaired.
      a. Notify the Owner's Representative when the building's fire alarm or detection systems will be changed.
      b. When the fire suppression system will be disabled for more than 4 total hours in a 24 hour period, additional time for notifications and additional Interim Life-Safety Measures will be required.
   4. Sources of Ignition: When temporary sources of ignition (ie: cutting, welding, plumbers torch operations) are anticipated.
      a. Interim Life-Safety Measures shall include a requirement to provide a fire watch when sources of ignition are present.
      b. Provide the Owner's Representative with monitoring reports for the fire watch.
   5. Combustibles: When construction operations involve large quantities of combustible material and debris.

1.05 ACCESS

A. Parking and Staging Area Access:
   1. Prior to execution of the Contract for Construction, Contractor shall coordinate with Owner's Representative for parking and site access requirements.
   2. Confine construction personnel, equipment, and materials to staging and construction areas as coordinated with the Owner's Representative.

B. Building Access:
   1. Prior to execution of the Contract for Construction, Contractor shall confirm with Owner's Representative if use of existing corridors, entrances, and toilets adjacent to or within construction area for access to Work is to be allowed. If access is allowed, coordinate

with Owner's Representative prior to commencing on-site work.

2. Limit working hours and building access for subcontractors.
3. Limit use of corridors, entrances, and toilets by subcontractors and employees.

1.06 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award.

B. Review Hospital Alteration Project Procedures as part of meeting.

1.07 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Dust Control Procedures: Report documenting specific procedures to be implemented for this project.

C. Fire Watch Reports: When required as per the requirements of this section.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Project record documents.

1.03 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

E. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Present required information in typewritten form.

E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required.

F. Execute certification by signature of authorized officer.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of work.

I. Submit one electronic and 0 hard-copies of each Application for Payment.

1.05 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.

B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required . Contractor shall prepare and submit a fixed price quotation within 10 days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.

E. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

F. Promptly enter changes in Project Record Documents.

1.06 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:

1. All closeout procedures specified in Section 01 70 00.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 43 25 - Substitution Request Form: Required form for substitution requests..

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
   1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
      a. Unavailability.
   2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
      a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

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

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form attached in section 00 43 25 - Substitution Request Form. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing the form attached to section 00 43 25 - Substitution Request Form. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

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

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

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

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

3.05 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Submittals for review, information, and project closeout.

F. Deferred Submittals.

G. Delegated Design.

H. Number of copies of submittals.

I. Requests for Interpretation (RFI) procedures.

J. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements: General product requirements.

B. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

D. Section 01 91 13 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.

1. Where submittals are indicated for review by both Architect and the Commissioning Authority, submit one extra and route to Architect first, for forwarding to the Commissioning Authority.
2. Where submittals are not indicated to be reviewed by Architect, submit directly to the Commissioning Authority; otherwise, the procedures specified in this section apply to commissioning submittals.
3. Section 11 05 00-Equipment Coordination: Coordination of Owner furnished equipment.

1.03 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:

1. Requests for Interpretation (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.
7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

1.04 PROJECT COORDINATOR

A. Project Coordinator: Construction Manager.

B. Cooperate with the Project Coordinator in allocation of mobilization areas of site; for field offices and sheds, traffic, and parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 10 00 - Summary.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for Interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Project Coordinator will schedule a meeting after Notice of Award.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, _____ and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum monthly intervals.

B. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:
   1. Contractor.
   2. Owner.

3. Architect.
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.

D. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Other business relating to work.

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

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.04 REQUESTS FOR INTERPRETATION (RFI)

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

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

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
a. Do not forward requests which solely require internal coordination between subcontractors.
2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
a. Approval of submittals (use procedures specified elsewhere in this section).

b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
   a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.

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

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

G. Review Time: Architect will respond and return RFIs to Contractor within 10 calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

3.05 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Format schedule to allow tracking of status of submittals throughout duration of construction.
2. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
3. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

3.06 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:

1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with submittal procedures article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.07 SUBMITTALS FOR DELEGATED DESIGN

A. Contractor shall coordinate and assume full responsibility for design, engineering, submittals, fabrication, transportation, and installation of this work.

B. Delegated Design efforts are as indicated in drawings:
1. Division 21 - Fire Suppression System
2. Division 28 - Fire Alarm and Detection System

C. Scheduling:
1. Submit to Architect or Engineer of Record for review prior to submittal to the Authority Having Jurisdiction (AHJ).
2. The Contractor shall submit to AHJ reviewed submittal documents indicating that they have been reviewed and found to be in general conformance with the design.

3.08 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.09 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Extra Copies at Project Closeout: See Section 01 78 00.

C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a single transmittal for related items.
   2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
   3. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
      a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
   4. Schedule submittals to expedite the Project, and coordinate submission of related items.
      a. For each submittal for review, allow 10 business days excluding delivery time to and from the Contractor.
      b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
      c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
   5. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
   6. Provide space for Contractor and Architect review stamps.
   7. Submittals not requested will be recognized, and will be returned "Not Reviewed",

B. Product Data Procedures:
   1. Submit only information required by individual specification sections.
   2. Collect required information into a single submittal.
   3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
   2. Do not reproduce Contract Documents to create shop drawings.
   3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
   1. Transmit related items together as single package.
   2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

E. Transmit each submittal with approved form.

F. For each submittal for review, allow 10 business days excluding delivery time to and from the Contractor.

3.12 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.

b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
2. Not Authorizing fabrication, delivery, and installation:

E. Architect's and consultants' actions on items submitted for information:
1. Items for which no action was taken:
a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
a. "Reviewed" - no further action is required from Contractor.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Testing and inspection agencies and services.

C. Control of installation.

D. Mock-ups.

E. Manufacturers' field services.

F. Defect Assessment.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

C. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Compliance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.03 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ and pay for services of an independent testing agency to perform specified testing and inspection.

B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.03 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
    a. To provide access to Work to be tested/inspected.
    b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    c. To facilitate tests/inspections.
    d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

F. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Code-required special inspections.

B. Testing services incidental to special inspections.

C. Submittals.

D. Manufacturers' field services.

E. Fabricators' field services.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 40 00 - Quality Requirements.

C. Section 01 60 00 - Product Requirements: Requirements for material and product quality.

1.03 DEFINITIONS

A. Authority Having Jurisdiction (AHJ): Agency or individual officially empowered to enforce the building, fire and life safety code requirements of the permitting jurisdiction in which the Project is located.

B. Special Inspection:
   1. Special inspections are inspections and testing of materials, installation, fabrication, erection or placement of components and connections mandated by the AHJ that also require special expertise to ensure compliance with the approved Contract Documents and the referenced standards.
   2. Special inspections are separate from and independent of tests and inspections conducted by Owner or Contractor for the purposes of quality assurance and contract administration.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Special Inspection Agency Qualifications: Prior to the start of work, the Special Inspection Agency is required to:
   1. Submit agency name, address, and telephone number, names of full time registered Engineer and responsible officer.
   2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
   3. Submit certification that Special Inspection Agency is acceptable to AHJ.

C. Special Inspection Reports: After each special inspection, Special Inspector is required to promptly submit at least two copies of report; one to Architect and one to the AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of Special Inspector.
      d. Date and time of special inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of special inspection.
      h. Date of special inspection.
      i. Results of special inspection.
      j. Compliance with Contract Documents.
   2. Final Special Inspection Report: Document special inspections and correction of discrepancies prior to the start of the work.

D. Test Reports: After each test or inspection, promptly submit at least two copies of report; one to Architect and one to AHJ.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test or inspection.
      h. Date of test or inspection.
      i. Results of test or inspection.
      j. Compliance with Contract Documents.

E. Certificates: When specified in individual special inspection requirements, Special Inspector shall submit certification by the manufacturer, fabricator, and installation subcontractor to Architect and AHJ, in quantities specified for Product Data.
   1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

1.05 SPECIAL INSPECTION AGENCY

A. Owner will employ services of a Special Inspection Agency to perform inspections and associated testing and sampling in accordance with ASTM E329 and required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.06 TESTING AND INSPECTION AGENCIES

A. Owner may employ services of an independent testing agency to perform additional testing and sampling associated with special inspections but not required by the building code.

B. Employment of agency in no way relieves Contractor of obligation to perform work in accordance with requirements of Contract Documents.

1.07 QUALITY ASSURANCE

A. Special Inspection Agency Qualifications:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SCHEDULE OF SPECIAL INSPECTIONS, GENERAL

A. Frequency of Special Inspections: Special Inspections are indicated as continuous or periodic.
   1. Continuous Special Inspection: Special Inspection Agency is required to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspection: Special Inspection Agency is required to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

3.02 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

A. Special Inspection Agency shall:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified reference standards.
   3. Ascertain compliance of materials and products with requirements of Contract Documents.

4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests or inspections specified.

B. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

C. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.03 TESTING AGENCY DUTIES AND RESPONSIBILITIES

A. Testing Agency Duties:
1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
2. Perform specified sampling and testing of products in accordance with specified standards.
3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
5. Perform additional tests and inspections required by Architect.
6. Submit reports of all tests or inspections specified.

B. Limits on Testing or Inspection Agency Authority:
1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the work.
3. Agency may not assume any duties of Contractor.
4. Agency has no authority to stop the work.

C. On instructions by Architect, perform re-testing required because of non-compliance with specified requirements, using the same agency.

D. Contractor will pay for re-testing required because of non-compliance with specified requirements.

3.04 CONTRACTOR DUTIES AND RESPONSIBILITIES

A. Contractor Responsibilities, General:
1. Deliver to agency at designated location, adequate samples of materials for special inspections that require material verification.
2. Cooperate with agency and laboratory personnel; provide access to approved documents at project site, to the work, to manufacturers' facilities, and to fabricators' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to work to be tested or inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested or inspected.
   c. To facilitate tests or inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing or inspection services.
5. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

3.05 MANUFACTURERS' AND FABRICATORS' FIELD SERVICES

A. When specified in individual specification sections, require material suppliers, assembly fabricators, or product manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, to test, adjust, and balance equipment as applicable, and to initiate instructions

when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary sanitary facilities.

B. Temporary Controls: Barriers, enclosures, and fencing.

C. Security requirements.

D. Waste removal facilities and services.

E. Project identification sign.

F. Field offices.

1.02 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.03 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

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

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

1.04 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.05 VEHICULAR ACCESS AND PARKING

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.06 WASTE REMOVAL

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.07 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated on drawings.

B. Erect on site at location indicated.

C. No other signs are allowed without Owner permission except those required by law.

1.08 FIELD OFFICES

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Lists of products to be removed from existing building.

B. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.

B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.

C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
   1. See drawings for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.

B. Use of products having any of the following characteristics is not permitted:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 61 16.
   2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.

5. Result in less construction waste. See Section 01 74 19
6. Are made of vegetable materials that are rapidly renewable.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish an extra 5% (minimum) of all interior finish materials unless stated otherwise in indivisual specification sections.

B. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

C. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 OWNER-SUPPLIED PRODUCTS

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

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

3.02 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

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

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

G. Comply with manufacturer's warranty conditions, if any.

H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

I. Prevent contact with material that may cause corrosion, discoloration, or staining.

J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 07 92 00 - Joint Sealants: Emissions-compliant sealants.

C. Section 09 91 23-Interior Painting: Emissions-compliant coatings

1.03 DEFINITIONS

A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

B. Interior of Building: Anywhere inside the exterior weather barrier.

C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

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

C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.

D. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).

E. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

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

1.06 QUALITY ASSURANCE

A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.

b. SCAQMD 1113 Rule.
c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Cutting and patching.

C. Surveying for laying out the work.

D. Cleaning and protection.

E. Starting of systems and equipment.

F. Demonstration and instruction of Owner personnel.

G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

D. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

E. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

F. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

G. Section 01 91 13 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

H. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

I. Section 07 84 00 - Firestopping.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Integrity of weather exposed or moisture resistant element.
   3. Efficiency, maintenance, or safety of any operational element.
   4. Visual qualities of sight exposed elements.
   5. Work of Owner or separate Contractor.

1.04 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.05 PROJECT CONDITIONS

A. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over

adjacent property.

1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.
2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

B. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1. Outdoors: Limit conduct of especially noisy exterior work to times as determined by Owner.
2. Indoors: Limit conduct of especially noisy interior work to times as determined by Owner.

1.06 COORDINATION

A. See Section 01 10 00 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

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

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

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

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 LAYING OUT THE WORK

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

B. Promptly notify Architect of any discrepancies discovered.

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

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

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

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

3.04 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.05 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

C. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

F. Restore work with new products in accordance with requirements of Contract Documents.

G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

I. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

J. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

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

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

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

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

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.08 SYSTEM STARTUP

A. Coordinate with requirements of Section 01 91 13 - General Commissioning Requirements.

B. Coordinate schedule for start-up of various equipment and systems.

3.09 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.10 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.11 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.12 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.13 MAINTENANCE

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

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

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

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

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.

E. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
   6. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.

F. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

G. Develop and follow a Waste Management Plan designed to implement these requirements.

H. The following sources may be useful in developing the Waste Management Plan:

I. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
   5. Incineration, either on- or off-site.

J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 25 00 - Substitution Procedures.

B. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to product substitutions.

D. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

E. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
   1. Submit to Architect for Owner's review and approval.
   2. If Owner wishes to implement any cost alternatives, the Contract Sum will be adjusted as specified elsewhere.
   3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
   4. Describe as many alternatives to landfilling as possible:
      a. List each material proposed to be salvaged, reused, or recycled.
      b. List the proposed local market for each material.
      c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
   5. Provide alternatives to landfilling for at least the following materials:
      a. Concrete.
      b. Bricks.
      c. Concrete masonry units.
      d. Asphalt paving.

C. Once Owner has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.

D. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

E. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:

a. Identification of material.
b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.
c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS

2.01 PRODUCT SUBSTITUTIONS

A. See Section 01 60 00 and Section 01 25 00.

B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 60 00:
   1. Relative amount of waste produced, compared to specified product.
   2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
   3. Proposed disposal method for waste product.
   4. Markets for recycled waste product.

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 10 00 for list of items to be salvaged from the existing building for relocation in project or for Owner.

B. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the

project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
   1. Provide containers as required.
   2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
   3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project record documents.

B. Operation and maintenance data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Documentation and Submittal Requirements
   1. Envelope record construction documents, applicable calculations, WSEC envelope compliance reports, and fenestration NFRC rating certificates.
   2. Thermal envelope certificate is required at project close out. Include:
      a. rated R-values of all opaque assembly insulation.
      b. U-factors & SHGCs for all fenestration assemblies.

C. Operation and Maintenance Data:
   1. Submit electronic PDF copy of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit electronic copy of completed documents 15 days prior to final inspection. This will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit electronic set of revised final documents in final form within 10 days after final inspection.

D. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.
   4. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.
   3. Include performance curves, with engineering data and tests.
   4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into bookmarked PDF format for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Cover: Identify as OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

C. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

D. Tables of Contents: List every item using the same identification as bookmarked. Where multiple PDFs are required, include Tables of Contents in PDF.

E. Drawings: Provide in PDF format.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment.
   3. Plumbing equipment.
   4. Items specified in individual product Sections.

C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Finishes, including flooring, wall finishes, ceiling finishes.
   2. Fixtures and fittings.
   3. Items specified in individual product Sections.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

B. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

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

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
   3. Provide one extra copy of each training manual to be included with operation and maintenance data.

D. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
   1. Format: Flash Drive.
   2. Label each device with session identification and date.

1.04 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

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

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

3.02 TRAINING - GENERAL

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

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor.

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

E. Provide training in minimum two hour segments.

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

G. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.

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

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

PART 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 Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
   2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
   3. Verify that operation and maintenance manuals submitted to 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. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect; in that case, submit to Architect first.
   2. Submit one copy to the Commissioning Authority, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Authority.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
   5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Product Data: If submittals to Architect do not include the following, submit copies as soon as possible:
   1. Manufacturer's product data, cut sheets, and shop drawings.
   2. Manufacturer's installation instructions.
   3. Startup, operating, and troubleshooting procedures.
   4. Fan and pump curves.
   5. Factory test reports.
   6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Completed Prefunctional Checklists.

PART 2 PRODUCTS

2.01 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 to become the property of Owner.

D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
   1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

PART 3 EXECUTION

3.01 COMMISSIONING PLAN

A. Commissioning Authority has prepared the Commissioning Plan.
   1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
   2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:
   1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
   2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
   3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
   4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.03 PREFUNCTIONAL CHECKLISTS

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
   1. No sampling of identical or near-identical items is allowed.
   2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
   3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
      a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
      b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
      c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
      d. Serial number of installed unit.
      e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
      f. Sensor and actuator calibration information.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
   1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
   2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
   3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
   4. If any Checklist line item is not relevant, record reasons on the form.
   5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
   6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
   7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
   1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
   2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
   3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
   4. When asked to review the proposed Checklists, do so in a timely manner.

D. Commissioning Authority Witnessing: Required for:
   1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
   2. A sampling of non-primary equipment, as allowed by the commissioning plan.

E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
   1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.04 FUNCTIONAL TESTS

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
   1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
   2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
   3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
   4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
   5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:
   1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
   2. Examples of Functional Testing:
      a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
      b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
      c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
      d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site

conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

3.05 SENSOR AND ACTUATOR CALIBRATION

A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:
   1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
   2. Verify that sensors with shielded cable are grounded only at one end.
   3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F 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, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
   3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.
   1. Disconnect sensor.
   2. Connect a signal generator in place of sensor.
   3. Connect ammeter in series between transmitter and building automation system control panel.
   4. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature.
   5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
   6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
   7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
   8. Reconnect sensor.
   9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
   10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
   11. If not, replace sensor and repeat.
   12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
   1. Watthour, Voltage, Amperage: 1 percent of design.
   2. Pressure, Air, Water, Gas: 3 percent of design.
   3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
   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.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.06 TEST PROCEDURES - GENERAL

A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.
2. Sampling is not allowed for:
a. Major equipment.
b. Life-safety-critical equipment.
c. Prefunctional Checklist execution.
3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
7. If YY percent of the units in the second sample fail, test all remaining identical units.
8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
   1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
   2. Other points will be monitored by the Commissioning Authority using dataloggers.
   3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
   4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
   5. Graphical output is desirable and is required for all output if the system can produce it.
   6. Monitoring may be used to augment manual testing.

3.07 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 78 00 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Owner will provide a report identifying known hazardous materials and toxic substances within the project area, and will provide for removal and disposal under separate contract.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

D. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

E. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Site Plan: Indicate:
   1. Vegetation to be protected.
   2. Areas for temporary construction and field offices.
   3. Areas for temporary and permanent placement of removed materials.

C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.
   1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove portions of existing site improvements and buildings as indicated on the drawings, and as required to accomplish the work.

B. Remove other items for salvage, relocation, and recycling.

C. Notify Owner immediately if hazardous materials or toxic materials are encountered.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.

5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner.

C. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

3.03 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Underslab vapor barrier.

C. Floors and slabs on grade.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. As Indicated in Structural drawings.

B. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide; 2022.

C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).

D. ACI PRC-305 - Guide to Hot Weather Concreting; 2020.

E. ACI PRC-306 - Guide to Cold Weather Concreting; 2016.

F. ACI PRC-308 - Guide to External Curing of Concrete; 2016.

G. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

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

I. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2024.

K. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.
   3. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.

D. Samples: Submit samples of underslab vapor barrier to be used.

E. Test Reports: Submit report for each test or series of tests specified.

F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 FORMWORK

A. Formwork Design and Construction: Comply with guidelines of ACI PRC-347 to provide formwork that will produce concrete complying with tolerances of ACI SPEC-117.

B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
   1. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
   2. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
   3. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches of concrete surface.

2.02 REINFORCEMENT MATERIALS

A. As indicated in structural drawings.

2.03 CONCRETE MATERIALS

A. As indicated in structural drawings.

2.04 ACCESSORY MATERIALS

A. Underslab Vapor Barrier: Multi-layer reinforced polyolefin or equivalent, complying with ASTM E 1745, Class A, 0.01 perms.
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
   2. Products:
      a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.
      b. Tex-Trude, LP; Xtreme Vapor Barrier (15-mil): www.tex-trude.com/#sle.
      c. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com/#sle.
      d. StegoWrap by Stego
      e. Substitutions: See Section 01 60 00 - Product Requirements.

2.05 BONDING AND JOINTING PRODUCTS

A. As indicated in structural drawings.

2.06 CURING AGENTS AND SEALERS

A. As indicated in structural drawings.

2.07 CONCRETE MIX DESIGN

A. As indicated in structural drawings.

2.08 MIXING

A. As indicated in structural drawings.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Underslab Vapor Barrier: Install vapor barrier in the floor slab assembly as shown on drawings and according to manufacturer's written recommendations.

B. Verify that forms are clean and free of rust before applying release agent.

C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

E. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

F. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

G. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Install joint devices in accordance with manufacturer's instructions.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than seven days.
   2. High early strength concrete: Not less than four days.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.10 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members, support members and struts.

B. Structural steel support members and struts.

C. Base plates.

D. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. As indicated in structural drawings.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2024).

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.

D. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.

F. ASTM A514/A514M - Standard Specification for High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding; 2022.

G. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.

H. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.

I. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2019.

J. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2023.

K. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification; 2021, with Errata (2023).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.

C. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles, Plates, and Channels: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Rolled Steel Structural Shapes: ASTM A992/A992M.

D. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.

E. Steel Plate: ASTM A514/A514M.

F. Pipe: ASTM A53/A53M, Grade B, Finish black.

G. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.

H. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

2.03 FINISH

A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

PART 3 EXECUTION

3.01 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Field weld components and shear studs indicated on shop drawings.

C. Do not field cut or alter structural members without approval of Architect.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00 - Sheet Metal Flashing and Trim: MRI metal skirt.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

C. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

E. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Plates: ASTM A283/A283M.

B. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

A. Landscape edging.

2.04 FINISHES - STEEL

A. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Rough opening framing for doors, windows, and roof openings.

C. Sheathing.

D. Preservative treated wood materials.

E. Miscellaneous framing and sheathing.

F. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

C. Section 06 17 53 - Shop-Fabricated Wood Trusses.

D. Section 06 18 00 - Glued-Laminated Construction.

E. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.

D. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2024, with Errata.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2024.

F. PS 1 - Structural Plywood; 2023.

G. PS 2 - Performance Standard for Wood Structural Panels; 2018.

H. PS 20 - American Softwood Lumber Standard; 2025.

I. WWPA G-5 - Western Lumber Grading Rules; 2021.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: as indicated in drawings, unless otherwise indicated.
   2. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
   3. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark

unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Western Wood Products Association; WWPA G-5.

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6):
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 2.

E. Small Beam Framing (2 by 6 through 4 by 16):
   1. Species and Grades: As indicated on drawings for various locations.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
   1. Lumber: S4S, No. 2 or Standard Grade.
   2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Roof Sheathing, as indicated in drawings: PS 2 type, rated Structural I Sheathing.

B. Wall Sheathing, as indicated in drawings: Plywood, PS 1, Grade C-D, Exposure I.

2.04 ACCESSORIES

A. Fasteners and Anchors:
   1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Sill Gasket on Top of Foundation Wall: 3/8 inch thick, closed-cell plastic foam.
   1. Width: 3-1/2 inches.
   2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

C. Sill Flashing: See Section 07 62 00.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
   1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
   1. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
      a. Treat lumber exposed to weather.
   2. Treat lumber in contact with roofing, flashing, or waterproofing.
   3. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.

B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

C. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. Nail panels to framing; staples are not permitted.

B. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

B. Prevent sawdust and wood shavings from entering the storm drainage system.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop-fabricated wood trusses.

B. Truss bridging.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ANSI/TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.

B. SBCA (BCSI) - Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses; 2018 (Updated 2020).

C. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.
   2. Provide shop drawings stamped or sealed by design engineer.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Handle trusses in accordance with SBCA (BCSI).

B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES

A. Wood Trusses: Design and fabricate trusses in accordance with ANSI/TPI 1 and to achieve specified design requirements indicated.

2.02 MATERIALS

A. Lumber:
   1. Moisture Content: Between 7 and 9 percent.
   2. Lumber fabricated from old growth timber is not permitted.

B. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

B. Fasteners: Electrogalvanized steel, type to suit application.

C. Bearing Plates: Electrogalvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports and openings are ready to receive trusses.

3.02 ERECTION

A. Install trusses in accordance with manufacturer's instructions, SBCA (BCSI); maintain a copy of applicable documents on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Install permanent bridging and bracing.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glue laminated wood beams.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 12 00 - Structural Steel Framing

C. Section 06 10 00 - Rough Carpentry.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.

C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings .

1.04 DELIVERY, STORAGE, AND HANDLING

A. Leave individual wrapping in place until finishing occurs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glued-Laminated Structural Units:
   1. As indicated in structural drawings..
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 GLUED-LAMINATED UNITS

A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.
   1. Verify dimensions and site conditions prior to fabrication.
   2. Cut and fit members accurately to length to achieve tight joint fit.
   3. Fabricate member with camber built in.
   4. Do not splice or join members in locations other than those indicated without permission.
   5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

B. Performance Criteria:
   1. Comply with applicable code for loads, seismic zoning, and other load criteria.
   2. As indicated in structural drawings.

2.03 FABRICATION

A. Fabricate glue laminated structural members in accordance with AITC Industrial grade.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports are ready to receive units.

3.02 ERECTION

A. Lift members using protective straps to prevent visible damage.

B. Set structural members level and plumb, in correct positions or sloped where indicated.

3.03 TOLERANCES

A. Framing Members: 1/2 inch maximum from true position.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cold-applied rubberized asphalt waterproofing.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete substrate.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for membrane.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Polyurethane Waterproofing:
   1. Tremco Commercial Sealants & Waterproofing; TREMproof 250GC: www.tremcosealants.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 FLUID-APPLIED WATERPROOFING MATERIALS

A. Sprayed Thin-Film Elastomeric Waterproofing: Elastomeric, UV-resistant coating capable of being applied to damp masonry and green concrete without adverse effect on adhesion; complying with requirements of ASTM C 836 except for minimum film thickness.

2.03 ACCESSORIES

A. Surface Conditioner: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify substrate surfaces are free of frozen matter, dampness, loose particles, cracks, pits, projections, penetrations, or foreign matter detrimental to adhesion or application of waterproofing system.

C. Verify that items penetrating surfaces to receive waterproofing are securely installed.

3.02 PREPARATION

A. Protect adjacent surfaces from damage not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions; vacuum substrate clean.

C. Do not apply waterproofing to surfaces unacceptable to waterproofing manufacturer.

3.03 INSTALLATION

A. Install waterproofing to specified minimum thickness in accordance with manufacturers instructions and NRCA (WM) applicable requirements.

B. Apply primer or surface conditioner at a rate recommended by manufacturer, and protect conditioner from rain or frost until dry.

C. Apply waterproofing in accordance with manufacturer's instructions .

1. Applied Thickness: Nominal thickness of 60 mils; minimum thickness at any point of 50 mils.

D. Apply extra thickness of waterproofing material at corners, intersections, and angles.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at cavity wall construction, perimeter foundation wall, and exterior wall behind fiber cement wall finish.

B. Batt insulation and vapor retarder and vapor retarder in exterior wall and wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and perimeter window and door shim spaces.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

B. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

C. Insulation at exterior wall behind fiber cement wall finish.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Continuous Insulation (CI) Board: Comply with ASTM C578, and manufactured using carbon black technology.
   1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   3. Type and Thermal Resistance, R-value: Type IV, 5.6 (0.98), minimum, per 1 inch thickness at 75 degrees F mean temperature.
   4. Board Size: 48 inch by 96 inch.
   5. Board Thickness: As indicated in drawings.
   6. Board Edges: Shiplap, at long edges.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.

B. Batt Insulation: ASTM C 665; preformed batt; friction fit, conforming to the following:
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.

2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: R-value as indicated.
6. Facing: Unfaced.
7. Products:
   a. CertainTeed Corporation: www.certainteed.com/#sle.
   b. Johns Manville: www.jm.com/#sle.
   c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
   d. Knauf Insulation GmbH: www.knaufinsulation.us..
8. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 ACCESSORIES

A. Sheet Vapor Retarder: CertainTeed Corporation; MemBrain™ Continuous Air Barrier & Smart Vapor Retarder

B. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.

C. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
   1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.
   2. Thickness: 45 mil, 0.045 inch, nominal.
   3. Size: 6 inches wide, in rolls 75 feet long.

D. Flashing Tape: Special reinforced film with high performance adhesive.
   1. Application: Window and door opening flashing tape.
   2. Width: As required for application.

E. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.
   1. Products:

F. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6 inches wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.

C. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

D. Extend boards over expansion joints, unbonded to foundation on one side of joint.

E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
   1. Apply adhesive in five continuous beads per board length.
   2. Install boards horizontally from base of foundation to top of insulation.
   3. Butt boards tightly, with joints staggered from insulation joints.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

A. Install boards horizontally on walls.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall and attic spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

E. Install with factory-applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.

F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

G. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over face of member.

H. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over face of member

I. Tape seal tears or cuts in vapor retarder.

J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane; tape seal in place.

K. Tape wall to ceiling joints of vapor retarder.

3.05 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate.

1.02 RELATED REQUIREMENTS

A. Section 07 62 00-Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

1.03 DEFINITIONS

A. Weather Barriers: Materials or assemblies forming water-resistive barriers, air barriers, vapor retarders, or combination of one or more assemblies.

B. Water-Resistive Barriers: Materials or assemblies installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly.

1.04 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.

C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on material characteristics, performance criteria, and limitations.

C. Shop Drawings: Provide drawings of special joint conditions.

D. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 WATER-RESISTIVE BARRIERS

A. Description: Materials installed behind exterior wall coverings; designed to prevent liquid water from further penetration into exterior wall assembly. Primary materials include self-adhered sheets; accessory materials include flashings and seam tapes.

B. Water-Resistive Barrier, Composite: Tear-resistant polyester sheet with UV-resistant acrylic coating.
   1. Air Permeance: 0.18 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 200 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 210 days of weather exposure.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, Class A when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: As recommended by sheet manufacturer.
   6. Products:
      a. Dorken Systems Inc; DELTA-FASSADE S: www.dorken.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Silicone sealants. DowSil 758 to establish air seal and airtight detailing as shown in the details. Coordinate with Specification Section 07 92 00.

B. High Temperature Rated Self-Adhered Membrane (HTSAM):
   1. Grace Ultra; install as underlayment below sheet metal coping caps and behind vertically oriented metal flashings.

C. Foil-Faced Self-Adhered Membrane (FFSAM):
   1. ProtectoWrap PS45 Butyl; install where necessary to achieve transition to adjacent construction or where weather-barrier must transition to a different membrane system such as roofing.

D. Primer:
   1. Water based as recommended by manufacturers for respective substrates.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions comply with requirements of this section.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Install continuous water-resistive barriers where indicated on drawings, with sheets lapped to shed water.

C. Self-Adhered Sheets:
   1. Prepare substrate in accordance with sheet manufacturer's installation instructions; fill and tape joints in substrate and between dissimilar materials.
   2. Lap sheets shingle-fashion to shed water and seal laps airtight.
   3. Upon placement of sheets, firmly press onto substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
   4. Use same material, or other material approved by sheet manufacturer, to seal sheets to adjacent substrates, and as flashing.
   5. At expansion joints, provide transition to joint assemblies approved by sheet manufacturer.

D. Openings and Penetrations in Exterior Water-Resistive Barriers:
   1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches onto water-resistive barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
   2. At openings filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
   3. At openings filled with nonflanged frames, seal water-resistive barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
   4. At head of openings, install flashing under water-resistive barrier extending at least 2 inches beyond face of jambs; seal water-resistive barrier to flashing.
   5. At interior face of openings, seal gaps between window and door frames and rough framing using appropriate joint sealant over backer rod.

6. Service and Other Penetrations: Form flashing around penetrating items and seal to surface of water-resistive barrier.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Take digital photographs of each portion of installation prior to covering up weather barriers.

3.05 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.

B. Flexible sheet membranes for eave protection, underlayment, and rakes.

C. Flashing.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Roof sheathing.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Edge and cap flashings.

C. Section 07 71 23 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.

B. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules; 2023.

C. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2020a.

D. ASTM F1667/F1667M - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2021a.

E. NRCA (RM) - The NRCA Roofing Manual; 2024.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating material characteristics, performance criteria, and limitations.

C. Shop Drawings: For metal flashings, indicate specially configured metal flashings, jointing methods and locations, and fastening methods and locations.

D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements for additional provisions.
   2. Extra Shingles: 100 sq ft of each type and color.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials with labels intact in manufacturer's unopened packaging until ready for installation.

B. When storing roofing materials on roofing system ensure that no damage occurs to supporting members and other materials.

1.07 FIELD CONDITIONS

A. Do not install shingles, eave protection membrane or underlayment when surface, ambient air, or wind chill temperatures are below 45 degrees F.

1.08 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Provide lifetime manufacturer's warranty for coverage against black streaks caused by algae.

C. Provide 5-year manufacturer's warranty for wind damage.

1.09 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Asphalt Shingles:
   1. Match existing style and color.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ASPHALT SHINGLES

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
   1. Fire Resistance: Class A, complying with ASTM E108.
   2. Algae resistant.
   3. Weight: 95 lb/100 sq ft.
   4. Self-sealing type.
   5. Style: Square.
   6. Color: Match existing.

2.03 SHEET MATERIALS

A. Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.

B. Underlayment: Self-adhering butyl-rubber sheet complying with ASTM D1970/D1970M; strippable release film.
   1. Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
   2. Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.

2.04 FLASHING

A. Metal Flashing: Galvanized steel with PVDF coating; see Section 07 62 00.

2.05 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, stainless steel, minimum 3/8-inch head diameter, 12-gauge, 0.109-inch nail shank diameter, 1-1/2 inches long and complying with ASTM F1667/F1667M.

B. Plastic Ridge Vents: Extruded plastic with vent openings that do not permit direct water or weather entry; flanged to receive shingles.

C. Flanged penetration flashing boots manufactured of fully soldered hot dipped galvanized sheet steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to starting this work.

B. Verify that roof deck is of sufficient thickness to accept fasteners.

C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

D. Verify roof openings are correctly framed.

E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 PREPARATION

A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.

B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

C. Broom clean deck surfaces before installing underlayment or eave protection.

D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with roof cement, and secure flange with nails.

3.03 INSTALLATION

A. Eave Protection Membrane:
   1. Install eave protection membrane from eave edge to minimum 48 inches up-slope beyond interior face of exterior wall.

B. Underlayment:
   1. Roof Slopes Up to 4:12: Install two layers of underlayment over area not protected by eave protection, with ends and edges weather lapped minimum 4 inches; stagger end laps of each consecutive layer and nail in place.
   2. Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches; stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.
   3. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

C. Metal Flashing:
   1. Install flashings in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
   2. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
   3. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

D. Shingles:
   1. Install shingles in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
      a. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
      b. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
   2. Place shingles in straight coursing pattern with 5-inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
   3. Project first course of shingles 3/4 inch beyond fascia boards.
   4. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
   5. Complete installation to provide weathertight service.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

3.05 PROTECTION

A. Do not permit traffic over finished roof surface; protect roofing until completion of project.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Siding substrate.

B. Section 07 25 00 - Weather Barriers: Water-resistive barrier under siding.

C. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

D. Section 09 91 13 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2022, with Editorial Revision (2023).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Installer's qualification statement.

D. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified in this section with not less than three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for years as indicated under Fiber-Cement Siding article sub-headings for "Warranty". Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length (Height): 120 inches, nominal.
   3. Width: 48 inches.

4. Thickness: 5/16 inch, nominal.
5. Finish: Factory applied primer.
6. Warranty: 50 year limited; transferable.
7. Products:
    a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 ACCESSORIES

A. Support for Cladding and Continuous Insulation: Continuous thermal Z-girts.
1. Fiberglass reinforced plastic (FRP) girts that provide cladding attachment support for siding.
2. Fasteners: As recommended by clip manufacturer.
3. Products:
    a. As indicated in drawings.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Trim: Same material and texture as siding.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Do not begin until unacceptable conditions have been corrected.

C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces during execution of this work.

B. Install weather-resistive barrier over entire substrate; lap and seal as required to shed water.

C. Install Sheet Metal Flashing:
1. Above door and window trim and casings.

3.03 INSTALLATION

A. Install siding in accordance with manufacturer's instructions and recommendations.
1. Read warranty and comply with terms necessary to maintain warranty coverage.
2. Use trim details as indicated on drawings.
3. Touch up field cut edges before installing.
4. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.

C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

D. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

E. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

F. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

G. Finish Painting: See Section 09 91 13.

3.04 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean faced panels in accordance with manufacturer’s maintenance instructions, using cleaning materials and methods acceptable to manufacturer.

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and exterior penetrations.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: High temperature SAM underlayment behind vertically oriented metal flashings.

1.03 REFERENCE STANDARDS

A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

D. ASTM B32 - Standard Specification for Solder Metal; 2020.

E. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

G. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

H. CDA A4050 - Copper in Architecture - Handbook; current edition.

I. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch thick base metal, shop pre-coated with PVDF coating.
   1. Polyvinylidene Fluoride (PVDF) Coating: Superior performing organic powder coating, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
   2. Color: As selected by Architect from manufacturer's standard colors.

C. Anodized Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 20 gauge, 0.032 inch thick; clear anodized finish.

D. Pre-Finished Aluminum: ASTM B209/B209M, 3005 alloy, H12 or H14 temper; 18 gauge, 0.040 inch thick; plain finish shop pre-coated with silicone modified polyester coating.
   1. Color: As selected by Architect from manufacturer's standard colors.

E. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gauge, 0.0156 inch thick; smooth No. 4 - Brushed finish.

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 FLASHING

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

B. All Saddle Flashings and Sill Pans shall be fully soldered.
   1. 24ga Sheet Metal Head Flashings, w/ End Dams

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
   1. Use silicone sealant except where prefinished sheet metal needs to be painted.
   2. If prefinished sheet metal is to be painted, use polyurethane or hybrid polyurethane.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

F. Solder: ASTM B32, Alloy Grade - Sn50 (50/50).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Solder metal joints for full metal surface contact, and after soldering wash metal clean with neutralizing solution and rinse with water.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

B. Precast concrete splash pads.

1.02 RELATED REQUIREMENTS

A. Section 07 31 13 - Asphalt Shingles

1.03 REFERENCE STANDARDS

A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

C. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Samples: Submit two samples illustrating component design, finish, color, and configuration.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. Alside, Inc: www.alside.com/#sle.
   2. ATAS International, Inc: www.atas.com/#sle.
   3. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Pre-Finished Galvanized Steel Sheet: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.
   1. Finish: Shop pre-coated with modified silicone coating.
   2. Color: As indicated.

2.03 COMPONENTS

A. Gutters: CDA rectangular style profile.

B. Downspouts: CDA rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: In accordance with CDA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.

D. Fasteners: Galvanized steel, with soft neoprene washers.

2.04 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.05 ACCESSORIES

A. Splash Pads: Precast concrete type, profiles size(s) as indicated; minimum 3,000 psi compressive strength at 28 days, with minimum 5 percent air entrainment.

B. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots and on-body cleanout and cover with neoprene gaskets.
   1. Configuration: Angular.
   2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Paint concealed sheet metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch.

3.03 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Connect downspouts to storm sewer system. Grout connection watertight.

C. Set splash pans under downspouts.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016 (Reapproved 2023).

C. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. Executed warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

1.06 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Dow: www.dow.com/#sle.
   2. Master Builders Solutions: www.master-builders-solutions.com/en-us/#sle.

3. Substitutions: See Section 01 60 00 - Product Requirements.

B. Self-Leveling Sealants:
1. Dow: www.dow.com/#sle.
2. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
3. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
1. Do Not Seal:
a. Joints indicated to be covered with expansion joint cover assemblies.
b. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.
c. Joints where sealant installation is specified in other sections.
d. Joints between suspended ceilings and walls.

B. Exterior Joints: Use nonsag nonstaining silicone sealant, unless otherwise indicated.
1. Silicone sealants interfacing or detailing weather-resistive barriers: DowSil 758
2. Silicone sealants interfacing or detailing sheet metals: DowSil 795
3. Paintable and interfacing/detailing siding, polyurethane hybrid sealant:
a. MasterSeal NP150

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 01 61 16.

2.04 NONSAG JOINT SEALANTS

A. Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Color: White.

C. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface.
1. Movement Capability: Plus and minus 35 percent, minimum.

2.05 ACCESSORIES

A. Sealant Backing Rod, Bi-Cellular Type:
1. Size: 25 to 50 percent larger in diameter than joint width.
2. Products:
a. Nomaco, Inc; SOF Rod: www.nomaco.com/#sle.
b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 09 91 13 - Exterior Painting: Field painting.

C. Section 09 91 23 - Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2024.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

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

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2023, with Editorial Revision.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

I. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

K. ITS (DIR) - Directory of Listed Products; Current Edition.

L. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

M. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

N. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.

O. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

P. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

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

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

S. UL (DIR) - Online Certifications Directory; Current Edition.

T. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   2. Fleming Door Products, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   3. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.
   5. Typical Door Face Sheets: Flush.
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   2. Door Thickness: 1-3/4 inches, nominal.
   3. Door Face Sheets: Flush.
   4. Weatherstripping: Refer to Section 08 71 00.
   5. Door Finish: Factory primed and field finished.

B. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

C. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   1. Attach fire rating label to each fire rated unit.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 18 gauge, 0.042 inch, minimum.
   3. Frame Finish: Factory primed and field finished.
   4. Weatherstripping: Separate, see Section 08 71 00.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 08 71 00.
   1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Coordinate installation of electrical connections to electrical hardware items.

F. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE

A. Refer to Door Schedule on the drawings.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Ceiling-Mounted Units:
   1. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   2. Size - Other Ceilings: 12 by 12 inches.
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. ACUDOR Products Inc: www.acudor.com/#sle.
      a. Ceiling-Mounted Units: ACUDOR GFRG - R.
      b. Wall- and Ceiling-Mounted Units: ACUDOR DW-5058.
   2. Babcock-Davis: www.babcockdavis.com/#sle.
   3. Karp Associates, Inc: www.karpinc.com/#sle.

B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
   1. Material: Steel.
   2. Door Style: Single thickness with rolled or turned in edges.
   3. Steel Finish: Primed.
   4. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
   5. Hardware:
      a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Picture windows

1.02 RELATED SECTIONS:

A. Section 07 25 00 - Weather Barriers

B. Section 07 90 05 - Joint Sealers

1.03 SUBMITTALS

A. Reference Section 01 33 00 - Submittal Procedure; submit following items:
   1. Product Data: Submit Milgard product data.
   2. Shop Drawings: Include window schedule, elevations, sections, details, & multiple-window assembly details. Include head, sill & jamb conditions; operable parts & direction/handing; and special mullion reinforcement details.

B. Quality Assurance/Control Submittals:
   1. Qualifications: Proof of Manufacturer's qualifications.
   2. U-Factor and Structural Rating charts required for NFRC and AAMA labeling requirements.
   3. Installation Instructions: AAMA 2400, ("Mounting Flange Installation") or AAMA 2410 ("Flush Fin Installation").

C. Closeout Submittals: Reference Section 01 78 00 – Submit following items:
   1. Owner's Manual/Maintenance Instructions.
   2. Warranties.

1.04 QUALITY ASSURANCE

A. Overall Standards: Comply with ANSI/AAMA/101/I.S.2, except where noted herein.

B. Certifications for Insulated Glass Units:
   1. Insulated glass units are certified to ASTM E2188/E2190 per the Associated Laboratories Incorporated (ALI) guidelines.

C. AAMA: Windows shall be Gold Label certified with label attached to frame per AAMA requirements.

D. NFRC: Windows shall be NFRC certified with temporary U-factor label applied to glass and an NFRC tab added to permanent AAMA frame label.

1.05 DELIVERY, STORAGE AND HANDLING

A. General: Reference Section 01 66 00 – Product Storage and Handling Requirements.

B. Comply with Manufacturer's/Dealer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in Manufacturer's standard packaging for protection of product.

D. Storage & Protection: Store products away from exposure to environmental conditions that may be harmful to materials.

E. Store materials off ground in an upright position. Provide cover from weather and construction activity.

F. Follow Manufacturer's instructions on label applied to units.

1.06 WARRANTY

A. Commercial Warranty:
   1. 10 Year Warranty.
   2. Warranty windows against defects in materials and workmanship including costs for replacement parts and skilled labor.

PART 2 - PRODUCTS

2.01 VINYL WINDOWS (BASIS OF DESIGN):

A. Milgard Manufacturing, Inc.; Milgard Style Line® Series

B. Substitutions: Reference Section 01 25 00 - Substitution Procedures

2.02 MATERIALS

A. Integral color PVC compound containing impact-resistant solid plasticizer, titanium dioxide UV inhibitor, and surface and color stabilizers.

2.03 SYSTEM DESCRIPTION

A. General Performance Requirements: Products and systems provided must be manufactured, fabricated, and installed to the following performance criteria:
   1. Comply with ANSI/AAMA/NWWDA 101/I.S.2, except as noted herein.
   2. U-Factor (NFRC 100): ~~.29~~ **.27**
   3. SHGC – Solar Heat Gain Coefficient (NFRC 200): ~~.27~~**.25**
   4. **VT - 0.56**

B. Structural Requirements: Products and systems provided must be capable of withstanding wind loads based on testing units representative of those indicated for Project that pass AAMA/NWWDA 101/I.S.2/NAFS, Uniform Structural Load Test:
   1. Design Wind Loads: Determine design wind loads, according to ASCE, Section 6, applicable to Product from basic wind speeds (MPH) at 33 feet above grade, based upon mean roof heights indicated on Elevations/Drawings

2.04 WINDOW TYPES

A. Picture Window - 6340 Series, 1-3/8” nail fin setback

2.05 GLAZING

A. Insulated Glass Units: ASTM E 774, Class A
   1. Glazing Type: Dual (Specify)
      a. ~~SunCoatMAX® Low-E/Clear~~**1/4 SunCoatMAX/i89**
   2. **Spacer Type:**
      a. **Foam spacer**
   3. Gas Filled:
      a. Argon
   4. Glass Thickness:
      a. Per Manufacturer’s Specifications

2.06 FABRICATION

A. Fabricate frames and sash with mitered and fusion welded corners and joints.

B. Trim and finish corners and welds to match adjacent surfaces.

C. Provide concealed metal reinforcements in sash frame for attachment of lock mechanism.

2.07 FINISH

A. Frame and Sash Color:
   1. Exterior: White
   2. Interior matched to exterior.

2.08 SOURCE QUALITY CONTROL:

A. Inspect windows in accordance with Manufacturer's Quality Control Program as required by AAMA Gold Label Certification.

PART 3- EXECUTION

3.01 EXAMINATION

A. Examine openings in which windows will be installed.

1. Verify that framing complies with AAMA 2400 (Mounting Flange Installation) & AAMA 2410 (Flush Fin Installation).
2. Verify that fasteners in framed walls are fully driven and will not interfere with window installation.

B. Coordinate with responsible entity to correct unsatisfactory conditions.

C. Commencement of work by installer is acceptance of substrate conditions.

3.02 INSTALLATION

A. Install windows in framed walls in accordance with AAMA 2400 (“Mounting Flange Installation”) and/or AAMA 2410 (“Flush Fin Installation”).

B. Do not remove temporary labels.

3.03 CLEANING AND FINISHING

A. Reference Section 01 74 00 – Cleaning and Waste Management.

B. Remove temporary labels and retain for Closeout Submittals.

C. Clean soiled painted surfaces and glass using a mild detergent and warm water solution with soft, clean cloths.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for hollow metal doors.

B. Electrically operated and controlled hardware.

C. Thresholds.

D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.

B. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

D. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.

E. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

D. Keying Requirements Meeting:
   1. Attendance Required:
   2. Agenda:
   3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
   5. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

E. Specimen warranty.

F. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

G. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.
   2. Exit Devices: Three years, minimum.
   3. Locksets and Cylinders: Three years, minimum.
   4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Door hardware of equivalent quality, size, type, finish, and func¬tion to that specified will be considered as an acceptable substitution except for products that have been standardized by the Owner. Requested substitutions must be submitted seven (7) days prior to bid date.

B. Coordinate with Owner standard manufacturer.

2.02 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.

2.03 ACCEPTABLE MANUFACTURERS

A. Door hardware of equivalent quality, size, type, finish, and function to that specified will be considered as an acceptable substitution except for products that have been standardized by the Owner. Requested substitutions must be submitted seven (7) days prior to bid date.

2.04 FINISHES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Install hardware for smoke and draft control doors in accordance with NFPA 105.

D. Use templates provided by hardware item manufacturer.

E. Do not install surface mounted items until application of finishes to substrate are fully completed.

F. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

G. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.

3.04 ADJUSTING

A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.06 PROTECTION

A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Reference Drawings for Interior Finish Products Schedule.

B. See individual spec sections for additional finish product information.

1.02 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. See individual spec sections for additional product submital requirements

PART 2 PRODUCTS

2.01 BASIS OF DESIGN FOR INTERIOR FINISH PRODUCTS

A. Reference drawings for Interior Finish Product Schedule

B. Product codes on "Interior Finish Product Schedule" are referenced in drawings.

C. Products listed may not be substituted unless noted otherwise.

D. Paint manufacturers may be substituted provided that the color of the substituted paint manufacturer is an exact match of the specified product.

PART 3 EXECUTION

3.01 INSTALLATION

A. See individual Sections for product execution requirements.

3.02 SCHEDULES

A. Reference drawings for Interior Finish Product Schedule.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Gypsum wallboard.

C. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 21 00 - Thermal Insulation: Acoustic insulation and Interior Vapor Retarder.

1.03 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

C. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

D. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

F. ASTM E413 - Classification for Rating Sound Insulation; 2022.

G. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on gypsum board and accessories.
   1. Provide data on gypsum board, accessories, and joint finishing system.
   2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Fire Rated Assemblies: Provide completed assemblies as indicated in drawings

2.02 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. CertainTeed Corporation: www.certainteed.com/#sle.
   2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
   3. USG Corporation: www.usg.com/#sle.
   4. Substitutions: See Section 01 60 00 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
   4. Paper-Faced Products:

a. As indicated in drawings..
b. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 GYPSUM BOARD ACCESSORIES

A. Finishing Accessories: ASTM C1047, galvanized steel, rolled zinc, or rigid plastic, unless noted otherwise.
1. Types: As detailed or required for finished appearance.

B. Joint Accessories: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Architectural Reveal Beads:
a. Reveal Depth: 1/2 inch.
b. Reveal Width: 3/4 inch.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.03 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
2. At exterior soffits, not more than 30 feet apart in both directions.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.04 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.
5. Level 0: Temporary partitions.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.05 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Division 23 - Air diffusion devices in ceiling.

C. Division 26 - Light fixtures in ceiling.

1.03 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

E. ISO 14644-1 - Cleanrooms and Associated Controlled Environments - Part 1: Classification of Air Cleanliness by Particle Concentration; 2015.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.
   2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
   1. Local authorities having jurisdiction.

2.03 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels, Type 1: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type III.
      a. Form: 2, water felted.
   2. Size: 24 by 24 inches.

3. Thickness: 3/4 inch.
4. Panel Edge: Square.
5. Color: White.
6. Suspension System: Exposed grid.
7. Products:
   a. Armstrong World Industries, Inc; Ultima Health Zone:www.armstrongceilings.com/#sle.
   b. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Exposed Suspension System: Hot-dip galvanized steel grid and cap.
   1. Structural Classification: Heavy-duty, when tested in accordance with ASTM C635/C635M.

2.05 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.

E. Perimeter Moldings: Same metal and finish as grid.
   1. Size: As required for installation conditions and specified Seismic Design Category.
   2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
   3. Gaskets For Perimeter Moldings: Closed-cell foam, factory-applied to molding.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636/C 636M and ASTM E 580/E 580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan unless noted otherwise..

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Overlap and rivet corners.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.

G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

J. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.05 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.

B. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2023.

B. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Wall Base: 5 percent of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.
   1. Manufacturers:
      a. Basis-of-Design Product: As indicated in drawings.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648, NFPA 253, ASTM E 648, or NFPA 253.
   3. Height: 4 inches.
   4. Thickness: 0.125 inch.
   5. Finish: Satin.
   6. Color: As selected by Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).

1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Clean substrate.

3.03 INSTALLATION - GENERAL

A. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

D. Set base in a continuous bead of sealant so as to provide a continuous seal at the floor.

3.05 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 09 00 00-Interior Finish Products: Additional product information.

B. Section 09 65 00 - Resilient Flooring; Rubber base.

1.03 REFERENCE STANDARDS

A. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute; 2002.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

D. Samples for Selection: Submit manufacturer's standard color palette for selection of edge strips.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Basis-of-Design Product: Match existing.

2.02 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect.
   1. Provide product from one of the following manufacturers or as indicated in drawings.
      a. Flexco
      b. Johnsonite
      c. Roppe

C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that concrete sub-floor surfaces are ready for carpet tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits

recommended by carpet tile manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Pre-ventilation: Pre-ventilate carpet by unrolling in a well-ventilated and unoccupied space for a minimum of four hours.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Install carpet tile in accordance with manufacturer's instructions and CRI 104.

D. Blend carpet from different cartons to ensure minimal variation in color match.

E. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

F. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.

G. Fully adhere carpet tile to substrate.

H. Provide smooth transition between carpets of different thicknesses by feathering substrate with feathering compound.

I. Trim carpet tile neatly at walls and around interruptions.

J. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
   7. Floors, unless specifically indicated.
   8. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
   9. Glass.
   10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

B. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

C. SSPC-SP 2 - Hand Tool Cleaning; 2018.

D. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
   4. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
1. If a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.

B. Paints:
1. Miller Paint: www.millerpaint.com.
2. PPG Paints: www.ppgpaints.com/#sle.
3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Primer Sealers: Same manufacturer as top coats.

D. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

C. Colors: Match existing.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints and varnishes.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 91 13 - Exterior Painting.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.

D. Samples: Submit two paper chip samples, 8.5x11 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: As indicated in drawings.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: See Section 01 61 16.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, wood, and shop primed steel.
1. Two top coats and one coat primer.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Coordination and Installation of Owner-Furnished-Contractor-Installed (OFCI) equipment.

1.02 RELATED REQUIREMENTS

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

1.03 COORDINATION

A. Coordinate construction operations and the work of subcontractors to assure efficient and orderly installation of OFCI equipment. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation of this equipment.
   1. Schedule construction operations in the 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 assure maximum accessibility for required maintenance, service, and repair.
   3. Make provisions to accommodate items scheduled for later installation.
   4. Contractor to provide and install all electrical boxes, conduits and backing for OFCI and OFOI items.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Delegated Design: Provide calculations and details for structural engineering and seismic bracing of equipment identified in Scope of Work below, unless otherwise noted below or on Drawings.

1.05 SCOPE OF WORK

A. The Owner will provide equipment to be incorporated into the work by the contractor as indicated in the drawings. Contractor to provide installation, including structural engineering and seismic bracing, electrical and/or plumbing services as required.

B. The Owner will provide equipment to be incorporated into the work by Owner's vendor as indicated in the drawings. The installation of this equipment will be performed by the Vendor. Contractor to coordinate schedule and installation requriements (such as backing) with Vendor. Provide rough-in mechanical and electrical items and blocking for this equipment as indicated on Drawings.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.01 GENERAL

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.02 CLEANING AND PROTECTION

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. 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.

PART 1 GENERAL

1.01 DESCRIPTION

A. The provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the plumbing work specified in this Division.

B. The requirements of this section apply to the fire suppression system. Any modification to the system shall be completed per requirements of NFPA-13.

C. Extend the existing fire sprinkler piping to provide coverage to the new addition. Install seismic flex connectors in the new fire protection piping to accommodate movement at the new seismic joint connection.

1.02 QUALITY ASSURANCE

A. Contractor Qualifications:
   1. Established fire protection contractor regularly engaged in the design and installation of automatic fire sprinkler systems.
   2. Employ workers experienced and skilled in this trade.

B. Governing Agency: All work in accordance with and accepted by the following hereafter referred to Governing Agencies:
   1. State of **Oregon** Fire Marshal.
   2. City of Wallowa, Oregon Fire Marshal.

C. Design Requirements:
   1. Comply with the latest issue of NFPA Standard 13
   2. Design, lay out and install a hydraulically calculated wet and/or dry pipe system utilizing code approved automatic devices designed particularly for use in this type of system.
   3. Fire Sprinkler Coverage: As required by the Governing Agency and including fire protection of all areas.
      a. Corridor Addition
   4. Occupancy Hazard**:** Minimum required sprinkler coverage is indicated. Final Occupancy Hazard designation in accordance with the Governing Agency requirements.
   5. Seismic Restraint: Include load calculations for seismic restraints on drawings. Provide Flexible Pipe connectors where pipe runs through seismic joints.
   6. Contractor shall review all drawings and determine where unheated spaces, concealed combustible spaces, overhead doors, or similar special conditions exist and provide sprinkler protection as required.
   7. Revisions to the Contractor's design required by the Governing Agency shall be at the Contractor's expense.

D. Acceptable Manufacturers: All sprinkler specialty material by Reliable, Globe, Tyco, Victaulic, and Viking, with UL or FM approval for use in automatic sprinkler systems. All materials and equipment suitable for 175 psi working pressure.

E. Field Wiring: It is the intent of these specifications that all systems shall be complete and operable. Refer to all drawings and specifications, especially the electrical drawings, to determine voltage, phase, circuit ampacity and number of connections provided. Provide all necessary field wiring and devices from the point of connection indicated on the electrical drawings. All equipment shall be installed in compliance with the Electrical Code and the equipment’s UL listing. Bring to the attention of the Architect in writing, all conflicts, incompatibilities, and/or discrepancies prior to bid or as soon as discovered.

1.03 WORK OF OTHER CONTRACTS

A. Work under this contract shall be conducted in a manner to allow for the future installations of such equipment or items listed in other sections of this Specification.

1.04 WORK OF OTHER DIVISIONS

A. Work under this Division shall be conducted in a manner to cooperate with the installation of such equipment or items as specified in other Divisions.

B. Consult all Drawings and Specifications in this project and become familiar with all equipment to be installed. Coordinate all aspects of the construction with the other trades on the job to ensure that all work and materials required to provide a complete and operational facility are included in the bid.

C. Coordinate work in congested areas with other trades. Give right-of-way to plumbing waste and vent piping and to ductwork.

1.05 SUBMITTALS

A. Working Drawings:
   1. Prepare fire protection system working drawing showing locations and types of heads or outlets, alarm valves and devices, pipe sizes and cutting lengths, test tees and valves, drain valves, and other related items. Plans shall include identification of hydraulic nodes referenced in the calculations. Each remote area included in the calculations shall be clearly identified on the plans.Plans shall be stamped and signed by the responsible certified designer. Plans shall be completed using CAD or Revit.
   2. Provide 3 sets of drawings showing sprinkler head locations and layout coordinated with architectural ceiling details including surface mounted light fixtures and similar items to the Architect for review prior to submitting details to the Governing Agencies.
   3. Provide 6 sets of drawings to the Architect to be provided to Insurance Underwriter for approval.
   4. Provide 6 sets of drawings to designated representatives of the Fire Marshal for approval.
   5. Then provide 6 sets of approved Drawings to the Architect for final review.

B. Submittals: Provide submittals for the following products.
   1. Sprinkler Heads: Product Data for each type of head.
   2. Piping supports and braces.
   3. Piping materials.

C. Test Reports: Submit certificates of completion of tests and inspections.

1.06 EXTRA STOCK

A. Additional Heads: Provide number, type and temperature rating installed as required to meet NFPA 13 requirements.

B. Storage Cabinet: Provide as required to receive reserve sprinkler heads and special installation tools required.

C. Index Label: Provide for each head indicating manufacturer, model, orifice, size or K-factor, and temperature rating. Also provide inside cabinet a list of heads stored within and brief description of where installed.

1.07 WARRANTY

A. Furnish, prior to application for final payment, three copies of written and signed guarantee effective a period of one year from date of completion and acceptance of entire project; agree to correct, repair and/or replace defective materials and/or equipment or the results of defective workmanship without additional expense to the Owner. Where no response satisfactory to the Owner has occurred within three working days from the written report of a warranty covered defect, the contractor shall agree to pay for the cost of repair of the reported defect by a contractor of the Owner's choice.

B. Where the manufacturer's guarantee exceeds one year, the longer guarantee shall govern and include the Contractor's labor.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Flex Connector: 300 Series stainless steel hose and braid with Sch. 40 carbon steel connections in U or V configuration to allow 3 dimensional movement of up to 2” with grooved connection. Working pressure and temperature of 200 PSI at 280 deg. F. Device shall be NFPA approved. Metraflex ML Series or approved.

B. Above Ground Water Piping: Use standard weight (schedule 40) black or galvanized steel pipe ASTM A53, A135, or A795, and cast iron screwed or mechanical joint fittings especially adapted and approved for sprinkler work. Use reducing fittings where changes in pipe size occur. Bushings are prohibited. Galvanized pipe required for dry system.

C. At Contractor's option, Schedule 10 black or galvanized steel pipe ASTM A135 or ASTM A795, and mechanical joint fittings specifically approved for sprinkler use, may be substituted for the black steel pipe specified above. Pipe shall be UL listed and FM approved for 300 psi working pressure. Pipe must have a CRR of 1.00 or greater. Galvanized pipe required for dry system.

D. Sprinkler Heads: Approved heads with temperature ratings required for service indicated.
   1. Unfinished Areas: Upright, pendant or sidewall spray type, plain bronze.
   2. Finished Areas: White**,** recessed and sidewall heads in finished ceilings, walls, and soffits with white escutcheons. Where piping is exposed use bronze upright heads.
   3. Dry pendant or dry sidewall heads for small areas subject to freezing and for pendant heads on dry pipe systems.

E. Pipe Escutcheons: Provide polished chrome escutcheons on pipe extending through finished walls and ceilings, oversized to meet seismic requirements.

F. Valves: UL and/or FM listed for fire protection service.
   1. Iron body OS&Y pattern, bronze mounted double disc, parallel seat.
   2. Iron body butterfly style with EPDM liner, bronze disc with indicating type gear operator.
   3. Bronze body ball valve, three-piece design, with approved operator.

G. Flexible Pipe Connectors: 300 Series stainless steel corrugated hose in dog leg arrangement to allow 3 dimensional movement of 2”. Flanged, weld or threaded connection per application and at Contractors choice. Grooved ends not allowed. Working pressure and temperature of 150 PSI at 280 deg. F. Metraflex Dog Leg Series or approved.

PART 3 EXECUTION

3.01 COORDINATION

A. Where the work must be sequenced and positioned with precision in order to fit into the available space, prepare accurate large scale shop drawings showing the actual physical dimensions required for the installation coordinated with other trades and submit prior to purchase/fabrication/installation of any of the elements involved in the coordination.

B. Cooperate with other trades in furnishing material and information for sleeves, bucks, chases, mountings, backing, foundations and wiring required for installation of mechanical items.

C. Coordinate all work with other trades and determine in advance necessary pipe routing to avoid conflicts. Rerouting of piping to avoid conflicts with plumbing piping or ductwork shall be the responsibility of the Contractor.

3.02 INSTALLATION

A. Connect to existing piping per requirements of the drawings. Call any deficiency to attention of Architect. Coordinate with work in Division 23.

B. Install all piping in a true and even manner with lines pitched for drainage and system arranged so that it can be entirely emptied of water. Install hangers at all branch line connections to cross mains and at all other points as required in NFPA standards.

C. Support all pipe work from building construction with mild steel hangers spaced not more than 12 feet on centers. Support mains independently of branches, and in no case shall branch hangers assume any portion of the weight of mains. Do not drill or punch flanges of beams, purlins, joists, etc. for hangar attachment without written permission from the structural engineer. Do not bend hanger rods. Provide seismic restraints and flexible connections in accordance with building code requirements.

D. Locate sprinkler heads in repeating, modular pattern, centered and accurately coordinated with ceiling grid as indicated. Coordinate design with lighting, HVAC system, and other ceiling features.

E. Conceal all piping in areas with finished ceilings unless indicated otherwise.

F. Install all wet system piping on the warm side of the building insulation. In attic spaces with blown in insulation, provide batt insulation, tenting, or baffles above the piping to prevent insulation from filling the area between the heated space and the piping.

G. Flexible sprinkler head drops, including attachment brackets, shall be installed in accordance with the manufacturer’s instructions and approvals.

H. Flex Connectors: Install such that there are not high or low points, place Metraflex dog leg in piping which it is installed per manufacturer’s installation manual.

3.03 TEST

A. Test all pipes to a hydrostatic pressure of 200 psi and maintain for four hours minimum. Perform other tests as directed by Governing Agency.

3.04 CERTIFICATE OF COMPLETION

A. Obtain and deliver to Owner a certificate, in duplicate, stating that system as installed has been inspected and accepted by authorities and/or agencies having jurisdiction, and that all regulations affecting work have been satisfied. Submit an acceptable certificate to the Owner before final payment is requested.

B. Certificate: Contractors Material and Test Certificate for Aboveground Piping, Figure 25.1 per NFPA 13.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the plumbing work specified in this Division.

B. The requirements of this Section apply to the plumbing systems specified in these Specifications and in other Division 22 sections.

C. Provide all items, articles, materials, equipment, operations and/or methods listed, mentioned, shown and/or scheduled on the Drawings and/or in these Specifications, including all labor, supervision, services, permits, fees, and incidentals necessary and required to provide a complete and operable facility with complete systems as shown, specified, and required by applicable codes.

D. The work shall include, but not be limited to, the following systems: Piping revisions for structural and seismic upgrades.

E. Advise subcontractor, suppliers, and vendors involved in the work specified in this Section of the applicable requirements.

1.02 QUALITY ASSURANCE

A. All work and materials shall conform to all applicable local and state codes and all federal, state and other applicable laws and regulations. All clarifications and modifications which have been cleared with appropriate authorities are listed under the applicable sections. All electrical products shall bear the label of a recognized testing laboratory such as UL or CSA.

B. Whenever the requirements of the Specifications or Drawings exceed those of the applicable code or standard, the requirements of the Specifications and Drawings shall govern.

C. Codes and Standards: Comply with the provisions of the following referenced codes, standards and specifications:
   1. Federal Specifications (FS)
   2. American National Standards Institute (ANSI)
   3. National Electrical Manufacturer's Association (NEMA)
   4. National Fire Protection Association (NFPA)
   5. Underwriters Laboratories, Inc. (UL)
   6. Factory Mutual (FM)
   7. International Building Code (IBC) with State and Local Amendments
   8. International Mechanical Code (IMC) with State and Local Amendments
   9. Uniform Plumbing Code (UPC) with State and Local Amendments
   10. American Society for Testing and Materials (ASTM)
   11. Americans with Disabilities Act (ADA)
   12. International Fire Code (IFC) with State and Local Amendments
   13. Energy Policy Act (EPAct)
   14. Manufacturers Standardization Society (MSS)
   15. National Sanitation Foundation (NSF)
   16. American Gas Association (AGA)

D. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name. Where two or more units of the same class of equipment are furnished, use product of the same manufacturer; component parts of the entire system need not be products of same manufacturer. Furnish all materials and equipment, new and free from defect and of size, make, type and quality herein specified or approved by the Architect. All materials shall be installed in a neat and professional manner.

E. All apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.

F. The Drawings and Specifications are complementary. What is called for by one shall be as though called for by both.

G. Drawings: Do not scale drawings for roughing-in measurements, nor use as shop drawings. Make field measurements and prepare shop drawings. Coordinate work with shop drawings of other specification divisions.

1.03 WORK OF OTHER DIVISIONS

A. Work under this Division shall be conducted in a manner to cooperate with the installation of such equipment or items as specified in other Divisions.

B. HVAC piping systems, fuel piping systems, fire suppression piping systems, and control devices and control wiring relating to the heating and air conditioning systems are specified under other Divisions of these Specifications except for provisions or items specifically noted on the Drawings or specified herein.

C. Consult all Drawings and Specifications in this project and become familiar with all equipment to be installed. Coordinate all aspects of the construction with the other trades on the job to ensure that all work and materials required to provide a complete and operational facility are included in the bid.

D. All sections of Division 22 are interrelated and shall be considered in their entirety when interpreting any material, method, or direction listed in any section of Division 22. Individual sections are not written for specific Subcontractors or suppliers but for the General Contractor.

1.04 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES (SUBMITTALS)

A. Submit in accordance with Division 1 full technical and descriptive shop drawing data on proposed materials and equipment as detailed in each section.

B. The Contractor shall verify that all equipment submitted can be delivered and installed within the time constraints of the construction period.

C. Include the manufacturer, type, style, catalog number, complete specification, certified dimensions, and description of physical appearance for each item and option submitted. Reproduction of catalog data sheets shall be clean and legible to show all details, including gauge of metal used.

D. Include only information on exact equipment to be installed, not general catalogs of the manufacturer. Where sheets show proposed equipment as well as other equipment, identify proposed equipment with rubber stamp arrow or similar concise method.

E. Submit with each copy a transmittal letter verifying that all included equipment submittals have been carefully considered for quality, dimensions, function, and have been coordinated with the Drawings and Specifications. Guarantee that proposed materials will meet or exceed the quality and function of those specified.

F. Include field wiring diagrams and connection diagrams for all control and/or low voltage systems, including floor plans.

G. Submittal Review: The submittal review process is a means to provide quality control. The action noted to be taken (or where conflicts with the contract documents are not noted) shall not be interpreted by the Contractor as automatic “change orders.” Approval of the data for substitution and shop drawings shall not eliminate the Contractor’s responsibility for compliance with Drawings or Specifications, nor shall it eliminate the responsibility for freedom from errors of any sort in the data discovered prior to or after the review process. Deviations, discrepancies, and conflicts between the submittals and the Contract Documents shall be called to the Architect's attention in writing at the time of transmittal of the data.

H. Submittals shall be in the form of PDF documents. Arrange submittals numerically with specification sections identified in tabs. All required sections shall be submitted at one time. Partial submittals will be rejected without review.

1.05 PRODUCT SUBSTITUTION

A. Materials other than those specified may be approved for this project providing a written request is submitted to the Architect prior to bid in accordance with Instructions to Bidders. Requests shall include complete specifications, dimensions, manufacturer and catalog number for each item for which approval is desired. If, in the opinion of the Architect, the material is not complete or if it is not an acceptable substitute, he may reject it. The Architect's evaluation will be based solely on the material submitted.

1.06 CHANGE ORDERS

A. All supplemental cost proposals by the Contractor shall be accompanied by a complete itemized breakdown of labor and materials without exception. At the Architect's request, the Contractor's estimating sheets for the supplemental cost proposals shall be made available to the Architect. Labor must be separated and allocated for each item of work.

1.07 RECORD DOCUMENTS

A. Project Record (As-Installed) Drawings:
   1. Maintain a set of record drawings on the job site as directed in Division 1.
   2. Keep Drawings clean, undamaged, and up to date.
   3. Record and accurately indicate the following:
      a. Depths, sizes, and locations of all buried and concealed piping and all cleanouts, whether concealed or exposed, dimensioned from permanent building features.
      b. Locations of all valves with assigned tag numbers.
      c. Changes, additions, and revisions due to change orders, obstructions, etc. Eradicate extraneous information.
      d. Locations of tracer wire terminal points.
      e. Model numbers of installed equipment.
   4. Make Drawings available when requested by Architect for review.
   5. Submit as part of the required Project Closeout documents. Final submittal will be in the form of reproducible drawings.

6. Quality of entire set of project record drawings to match the quality of the contract documents; quality to be judged by Architect. Computer-aided design drafting (CADD) shall be used to complete project record drawings. Use standards set in contract documents. Note field modifications, all addenda and change order items on project record drawings. If deficiencies are found in either the quality or the accuracy of the drawings, they will be returned unapproved. Additional review of subsequent submissions shall be at the Contractor's expense.

1.08 WARRANTY

A. Furnish, prior to application for final payment, three copies of written and signed guarantee effective a period of one year from date of completion and acceptance of entire project; agree to correct, repair and/or replace defective materials and/or equipment or the results of defective workmanship without additional expense to the Owner. Where no response satisfactory to the Owner has occurred within three working days from the written report of a warranty covered defect, the Contractor shall agree to pay for the cost of repair of the reported defect by a Contractor of the Owner's choice.

B. Where the manufacturer's guarantee exceeds one year, the longer guarantee shall govern and include the Contractor's labor.

PART 2 PRODUCTS

2.01 GENERAL

A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of two years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.

B. Compatibility: Provide products which are compatible with other portions of the work and provide products with the proper or correct power and fuel-burning characteristics, and similar adaptations for the project.

C. Efficiency: Service (Domestic) Water Heating Equipment shall comply with ASHRAE Standard 90.1-2019 and the State Energy code. Where equipment efficiencies are indicated, the use of alternate or substitute manufacturer's equipment with lower efficiencies is not permitted.

D. Storage and Handling:
1. Delivery: Deliver to project site with manufacturer's labels intact and legible.
2. Handling: Avoid damage.
3. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

2.02 VALVES

A. General: Provide factory fabricated valves of the type, body material, temperature and pressure class, and service indicated. Bronze gate, globe and check valves shall comply with MSS-SP-80. Ball valves shall comply with MSS-SP-110. Iron gate and globe valves shall comply with MSS-SP-70. Iron check valves shall comply with MSS-SP-71. Butterfly valves shall comply with MSS-SP-67. Valve size same as connecting pipe size.

B. Acceptable Manufacturers: Milwaukee, Crane, Grinnell, Nibco, Hammond, Stockham, Legend, Watts, and Walworth. Grooved end valves Victaulic, Gruvlock, or accepted substitute. NIBCO numbers are given except as noted. Where possible, provide valves from a single manufacturer.

C. Valve styles: Domestic hot and cold water systems.
1. Valves 2" and Smaller:

a. Ball: Two-piece, bronze body, stainless steel ball and stem, lead free, full port, 600 psi WOG, Fig. S-585-66-LF.
b. Check: Bronze body, swing check, 200 psi WOG, T/S-413B (bronze disc) or T/S-413Y (Teflon disc).

2. Valves 2" through 12":
a. Butterfly: Ductile iron body, aluminum bronze disc, 200 psi WOG, Lugged body – LD-2000, Wafer body – WD-2000, Grooved body – GD-4765.
b. Check (2 ½" and larger): Iron body, bronze trim, Class 125, F-918-B (swing type).

D. Butterfly Valve Operators: Locking lever for shut-off service; “Memory Stop” for lever handle with 10 position throttling plate for throttling service; gear operator with babbitt sprocket rim for chain-operated valves and gear operators on all 8" or larger valves.

E. Butterfly Valve Style: Lug-type with cap screws for all valves utilized for equipment isolation for servicing. Lug and grooved style valves shall be capable for use as isolation valves and recommended by manufacturer for dead-end service at full system pressure.

F. Insulated Valves: Install extended-stem valves in all piping specified as insulated, and arrange in the proper manner to receive insulation.

G. Selection of Valve Ends (Pipe Connections): Select and install valves with ends matching the types of pipe/tube connections.

2.03 HANGERS AND SUPPORTS

A. General: Provide factory-fabricated horizontal piping hangers, clamps, hanger rod, inserts, supports, etc., of the indicated MSS type and size. The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry Practice SP-58 and SP-69 are referenced in this section. Seismic pipe support details shall be designed and sized by a Professional Engineer licensed in the State of Oregon. Design shall comply with ISSC Chapter 16.

B. Manufacturers: B-Line, Carpenter & Paterson, Grinnell, Michigan, Superstrut, Tolco, Erico, or accepted substitute. Grinnell figure numbers in parentheses where applicable (or other manufacturers as noted).

C. Corrosion Protection: Provide materials which are zinc plated or factory painted to prevent corrosion. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated, plastic coated, or by other recognized industry methods.

D. Seismic Requirements: Provide seismic restraints in accordance with OSSC Section 1613. Design restraint systems in accordance with “Seismic Restraint Manual: Guidelines for Mechanical Systems,” Second Edition, 1998, SMACNA, or “A Practical Guide to Seismic Restraint” ASHRAE RP-812, 1999. See structural for Seismic Importance Factor.

E. Horizontal Piping Hangers and Supports:
1. Adjustable Clevis Hanger: MSS Type 1 (Fig. 260).
2. Adjustable Band Hanger: MSS Type 7 (Fig. 97), fabricated from steel.
3. Adjustable Swivel-Band Hanger: MSS Type 10 (Fig. 70).
4. Clamp: MSS Type 4 (Fig. 212, 216).
5. Double-Bolt Clamp: MSS Type 3 (Fig. 295A, 295H), including pipe spacers.
6. Adjustable Saddle-Support: MSS Type 36 (Fig. 258) and MSS Type 37 (Fig. 259), including saddle, pipe and reducer. Fabricate base-support from steel pipe and include cast-iron flange or welded-steel plate.

7. Channel Support System: Galvanized, 12 gauge channel and bracket support systems, single or double channel as indicated on the Drawings or as required by piping and equipment weights. Grinnell “Power Strut” channel. Acceptable Manufacturers: Super Strut, Globestrut, Bee, Kindorf or Unistrut.
8. Resilient Pipe Clamps:
   a. Resilient pipe clamps shall consist of pipe clamps with a resilient sleeve installed between the pipe and the clamp so that there is no metal-to-metal contact between these elements. The resilient sleeve shall consist of ¼ inch thick, 30 durometer, solid neoprene. A metal strap shall be installed between the sleeve and the clamp, if required, to assure even loading of the resilient material and no obvious deflection.
   b. Alternatively, the following are acceptable: Holdrite swivel loop hangers and Holdrite j-hangers by Hubbard Enterprises, or approved equal.

F. Vertical Pipe Clamps:
1. Two-Bolt Riser Clamp: MSS Type 8 (Fig. 261).
2. Four-Bolt Riser Clamp: MSS Type 42 include pipe spacers at inner bolt-holes.

G. Hanger Attachment:
1. Hanger Rod: Rolled threads, zinc plated. Right hand threaded.
2. Turnbuckles: MSS Type 13 (Fig. 230).
3. Weldless Eye-Nut: MSS Type 17 (Fig. 290).
4. Malleable Eye-Socket: MSS Type 16 (Fig. 110R).
5. Clevises: MSS Type 14 (Fig. 299).

H. Building Attachments:
1. Concrete Inserts: MSS Type 18 (Fig. 282), steel or Grinnell Power-Strut PS349 continuous channel. Acceptable Manufacturers: Michigan Hanger, Globestrut, Unistrut, Super Strut.
2. Clamps: MSS Type 19 (Fig. 285, 281), Type 20, 21 (Fig. 225, 226, 131), Type 23 (Fig. 86, 87, 88), Type 25 (Fig. 227), Type 27 through 30 where applicable.

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

A. Site Examination: Before starting work, carefully examine site and all contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, roughing-in dimensions and equipment locations before proceeding with any of the work.

B. Utility Locations: The location of existing utilities, wires, conduits, pipes, ducts, or other service facilities are shown in a general way only on the Drawings and are taken from existing records. Ascertain whether any additional facilities other than those shown on the plans may be present and determine the exact location and elevations of all utilities prior to commencing installation.

C. Discrepancies: Report immediately any error, conflict or discrepancy in Plans, Specifications and/or existing conditions. Do not proceed with any questionable items of work until clarification of same has been made. Should rearrangement or re-routing of piping be necessary, provide for approval the simplest layout possible for that particular portion of the work.

3.02 GENERAL INSTALLATION

A. Locating and Positioning Equipment: Observe all Codes, Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard.

3.03 VALVE INSTALLATION

A. General: Comply with the following requirements:
   1. Install valves where required for proper operation of piping and isolation of equipment, including valves in branch lines where necessary to isolate sections of piping, and where shown on the drawings. Install valves at low points in piping systems that must be drained for service or freeze protection.
   2. Locate valves in accessible spaces (or behind access panels) and so that separate support can be provided when necessary.
   3. Install valves with stems pointed up, in the vertical position where possible, but in no case with stems pointed downward from a horizontal plane.
   4. Install ball valves such that the handle points to the direction of flow.

B. Insulated Valves: Install extended-stem valves in all piping specified as insulated, and arrange in the proper manner to receive insulation.

C. Valve Access: Provide access panels to all valves installed behind walls, in furring or otherwise inaccessible.

3.04 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Proceed with the installation of hangers, supports and anchors only after the required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) the proper placement of inserts, anchors and other building structural attachments.
   1. Install hangers, supports, clamps, and attachments to support piping and equipment properly from the building structure. Use no wire or perforated metal to support piping, and no supports from other piping or equipment. For exposed continuous pipe runs, install hangers and supports of the same type and style as installed for adjacent similar piping.
   2. Prevent electrolysis in the support of copper tubing by the use of cushion clamps or 2 layers of UPC 10 mil. tape. Copper plated hangers alone are not sufficient protection.
   3. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at panel points only.
   4. Support compressed air piping with resilient pipe clamps.
   5. Only use hangers approved for acoustic deck application. See Part 2 for specifics.
   6. Do not support any devices from lower cord of trusses.

B. Provisions for Movement:
   1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends and similar units. Install specified seismic restraints to restrict excessive movement.
   2. Install hangers and supports so that equipment and piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
   3. Install hangers and supports to provide the indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded. Comply with the following installation requirements:
      a. Clamps: Attach clamps, including spacers (if any), to piping outside the insulated piping support. Do not exceed pipe stresses allowed by ANSI B31.
      b. Insulated Pipe Supports: Insulated pipe supports shall be supplied and installed on all insulated pipe and tubing.
      c. Load Rating: All insulated pipe supports shall be load rated by the manufacturer based upon testing and analysis in conformance with ASME B31.1, MSS SP-58, MSS SP-69 and MSS SP-89.
      d. Support Type: Manufacturer's recommendations, hanger style and load shall determine support type.

e. Insulated Piping Supports: Where insulated piping with continuous vapor barrier or where exposed to view in finished areas is specified, install hard maple wood insulation shields (Elcen Fig. 216) or steel pipe covering protection shields (MSS type 39) at each hanger.

C. Pipe Support:
1. Vertical Spacing: Support at base, at equivalent of every floor height (maximum 10' as required by Code) and just below roof line.
2. Screwed or Welded Steel or Copper Piping: Maximum hanger spacing shall be as follows:

	Steel	Copper
1-1/4" and smaller	7' span	6' span
1-1/2" pipe	9' span	6' span
2" pipe	10' span	10' span
2-1/2" & larger	12' span	10' span

3. Cast Iron Soil Pipe:
a. Hubless and Compression Joint: At every other joint except when developed length exceeds 4', then at each joint.
b. Additional Support: Provide at each horizontal branch and/or at concentrated loads to maintain alignment and prevent sagging.
4. Install additional hangers or supports at concentrated loads such as pumps, valves, etc. to maintain alignment and prevent sagging.
5. Support Rod: Hanger support rods sized as follows:

Pipe and Tube Size		Rod Size	
Inches	mm	Inches	mm
1/2" to 4"	12.7 to 101.6	3/8"	9.5
5" to 8"	127.0 to 203.2	1/2"	12.7
10" to 12"	254.0 to 304.8	5/8"	15.9

D. Adjust hangers and supports to bring piping to proper levels and elevations.

E. Provide all necessary structural attachments such as anchors, beam clamps, hanger flanges and brackets in accordance with MSS SP-69. Attachments to beams wherever possible. Supports suspended from other piping, equipment, metal decking, etc., are not acceptable.

F. Horizontal banks of piping may be supported on common steel channel member spaced not more than the shortest allowable span required on the individual pipe. Maintain piping at its relative lateral position using clamps or clips. Allow lines subject to thermal expansion to roll axially or slide. Size channel struts for piping weights.

G. Installation of drilled-in concrete anchors shall comply with the manufacturer’s instructions for working load, depth of embedment, and spacing between anchors and from the edge of the slab. Use only wedge style anchors.

H. Seismic Restraints: Install restraints where recommended in SMACNA “Seismic Restraint Manual.” Show analysis of supporting structure, anchorages, and restraints in accordance with OSSC Section 1613 and reference ASCE standard. Seismic restraint system components shall be approved by the California Office of Statewide Health Planning and Development (OSHPD). Acceptable Manufacturers: Amber/Booth, Mason Industries, Tolco, or approved.

3.05 PROTECTION

A. Protect all work and materials against loss or damage. Close all pipe openings with caps or plugs. At final completion, thoroughly clean and deliver all work and equipment in an unblemished new condition. Keep all motors and bearings in watertight and dustproof covers during entire course of installation.

B. Protect floors, walls, framing and sheathing where pipe cutting and threading operations are conducted with plastic sheeting under plywood sheets. Extend plastic sheeting beyond the plywood. Clean-up metal cuttings, oil, etc., daily or as necessary to prevent debris from being tracked beyond the protected area. Damages, as determined by the Architect, due to the pipe cutting/threading operation shall be repaired by the responsible trade.

3.06 CUTTING AND PATCHING

A. General: Comply with the requirements of Division 1 for the cutting and patching of other work to accommodate the installation of mechanical work. Do all necessary cutting and patching of existing building and yard surfaces required for completion of the mechanical work. Patch to match finish and color of adjacent surfaces. Coordinate work in remodel and new areas to avoid cutting of new finished surfaces.

3.07 MECHANICAL PAINTING

A. See Section 09 9000 for Materials and Requirements.

3.08 PLUMBING WORK CLOSEOUT

A. General: Refer to the Division 1 sections for general closeout requirements. Calibrate all equipment requiring same. Complete each system as shown or specified herein and place in operation except where only roughing-in or partial systems are called for. Each system shall be tested and left in proper operation free of leaks, obstructions, or contamination.

B. Record Drawings: Submit record set of Drawings required in Division 1 as previously specified in this Section.

C. Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration with the Architect present, and with the Owner's operating personnel present, to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system, and replace dirty filters, excessively worn parts and similar expendable items of the work.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the insulation of plumbing systems specified elsewhere in these specifications.

B. The requirements of Section 22 05 00, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Minimum Insulation Thickness and Thermal Performance: Comply with Chapter 13 provisions of the State of Oregon Structural Specialty Code.

B. Composite (Insulation, Jacket or Facing and Adhesives) Fire and Smoke Hazard Ratings: Not to exceed a flame spread of 25 or smoke development of 50.

C. Component Ratings of Accessories (Adhesives, Mastics, Cements, Tapes, Finishing Cloth for Fittings): Same as “B” requirements above and permanently treated. No water soluble treatments.

1.03 SUBMITTALS

A. Submit catalog data and performance characteristics for each product specified.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: In addition to the requirements specified in Section 22 05 00, the following apply:
   1. Deliver insulation, coverings, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp or label affixed showing fire hazard ratings of the products. Store insulation in original wrappings and protect from weather and construction traffic.
   2. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation. Remove such insulation from project site.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Insulation Manufacturers: Johns Manville, Owens-Corning, Knauf, Certain Teed, Armstrong, Pabco, Imcoa or Nomaco. Johns Manville products are listed unless indicated otherwise.

B. Adhesive Manufacturers: Foster, 3M, Insul-Coustic, Borden, Kingco or Armstrong.

2.02 PIPING INSULATION

A. Interior and Exterior Piping Systems 32 to 180 Deg. F: Glass fiber preformed pipe insulation with a minimum K-value of 0.23 at 75 deg. F, a minimum density of 3.5 pounds per cubic foot within all-service vapor barrier jacket, vinyl or pre-sized finish and pressure sensitive seal. Johns Manville “Micro-Lok.”

B. Pipe Temperatures Minus 30 to 180 Deg. F: Flexible, preformed, pre-slit, self-sealing elastomeric pipe insulation up to 2-1/8" ID, thermal conductivity of 0.27 BTU/hr. sq. ft./in. at 75 deg. F and vapor transmission rating of 0.2 perms/inch. On cold surfaces, apply in thickness necessary to prevent condensation on the surface at 85 deg. F and 70% RH. Armstrong “Armaflex 2000” or, in concealed locations, Imcoa or Nomaco also approved.

2.03 INSULATION ACCESSORIES

A. Insulation Compounds and Materials: Provide rivets, staples, bands, tapes, adhesives, cements, coatings, sealers, welded studs, etc., as recommended by the manufacturer for the insulation and conditions specified. No staples allowed on cold water piping systems.

B. PVC Protective Jacketing and Valve and Pipe Fitting Covers: Johns Manville Zeston 2000, Proto LoSmoke, or Ceel-Co Ceel-Tite 100 Series with precut fitting fiberglass insulation or approved.

C. Jacket Lap Sealing Adhesives: Foster Drion 85-75 contact cement or approved substitute.

D. Saddles and Shields: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
   1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi (690-kPa) minimum compressive strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

PART 3 EXECUTION

3.01 PIPING INSULATION

A. General: At Contractor’s option and in accordance with Part 2 of this section, elastomeric insulation may be installed on domestic water piping in thicknesses equivalent to the glass fiber insulation. Installation shall comply with the manufacturer’s recommendation with joints and seams completely sealed.

B. Domestic Water Piping:
   1. Insulate with glass fiber pipe covering, 1" thick for cold water piping and for 1" and smaller hot water piping; 1-1/2" for 1-1/4" and larger hot water piping.
   2. Insulate hot water return piping same as cold water piping.
   3. At Contractor’s option and in accordance with Part 2 of this section, elastomeric insulation may be installed on domestic water piping (where not exposed) in thicknesses equivalent to the glass fiber insulation. Performance installation shall comply with the manufacturer’s recommendation with joints and seams completely sealed. Insulation of PEX cold water lines where concealed is not required.

C. Pipe Fittings:
   1. Insulate and finish all fittings including valve bodies, bonnets, unions, flanges and expansion joints with precut fiberglass insulation and preformed PVC covers sealed to adjacent insulation jacket for continuous vapor barrier covering over all fittings.
   2. Provide removable/reusable insulation covers on 4" and larger valves, unions, flanges, pump casings, strainers and similar fittings or equipment requiring periodic service.

D. Protective Covering: Install continuous protective PVC covering on all piping and fittings exposed in finished spaces (areas without ceilings). Install with rivets or cement seams and joints. Install on piping in mechanical rooms or crawl spaces subject to damage. Where a person must crawl under/over pipe or step over pipe that is subject to damage.

E. Insulated Piping: Comply with the following.
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.

b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
c. Do not exceed pipe stress limits according to ASME B31.9.

2. Install MSS SP-58, Type 39 or Type 40 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.
3. Shield Dimensions for Pipe: Not less than the following.
   a. NPS 1/4 to NPS 3-1/2 (DN8 to DN90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN125 and DN150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 and NPS 14 (DN200 and DN350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 and NPS 24 (DN400 and DN600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
4. Pipes NPS 8 (DN200) and Larger: Include wood inserts.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

F. Piping Insulation Lap Seams and Butt Joints: Install insulation jacket in accordance with manufacturer's recommendation and without staples on cold water lines. Where jacket joint and lap seams have not adhered, remove affected section of insulation and reinstall or apply lap sealing adhesive in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide pipe, pipe fittings, piping specialties, pumps and related items required for complete piping system.

B. Related Work: The requirements of Section 22 0500, Common Plumbing Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. General: ASTM, and ANSI Standards are indicated. In addition, special standards are referenced where neither ASTM nor ANSI Standards are applicable.

B. Labeling: All piping shall be continuously and legibly labeled on each length as required by codes and standards and including as a minimum, country of origin, manufacturer's identification marking, wall thickness designation, and applicable standards and approvals. Fittings shall be labeled as required by the referenced standard. Tubular fixture traps shall be stamped with manufacturer's mark and material thickness.

C. Potable Water Valves: Potable water piping materials not limited to faucets, mixing valves, or pressure reducing valves. Valves shall meet NSF Standard 61, Section 9, for drinking water faucets and shall be brass construction. Brass components which contact water within the faucet shall be from brass which contains no more than 3 percent lead by dry weight.

D. Concealed Plastic Piping: No concealed plastic piping inside the building unless approved by Code or Governing Authorities.

E. Definitions: Where piping fluid is not indicated in the following paragraphs, provide similar piping materials for similar fluids (i.e., "make-up water" = "domestic water"; "wet stand pipe" = "fire sprinkler pipe"; "drainage piping" = "sanitary/storm sewer piping").

F. Plumbing System Disinfection shall be performed by an experienced, qualified, chemical treatment agency.

1.03 STORAGE AND HANDLING

A. Provide factory-applied end caps on each length of pipe and tube. Maintain end caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.04 SUBMITTALS

A. Submit catalog data for each product specified.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Copper Pipe and Tube:
   1. Application:
      a. Priming lines.
   2. Pipe: ASTM B88.
      a. Above Ground Domestic Water: Type L hard temper copper with soldered joints.
      b. Underground Domestic Water and Priming Lines: Type L soft annealed with no joints or type K hard tempered copper with silver soldered joints.
   3. Fittings: Wrought copper solder-joint fittings, ANSI B16.22.

B. Cast Iron DWV Pipe:
   1. Application: 1-1/2" and larger.
      a. Sanitary waste
      b. Plumbing vent
      c. Rain drain
   2. Pipe: Hubless cast iron soil pipe, CISPI 301-05/ASTM A 888-05. Produced by American manufacturer only. Foreign produced piping is not allowed.
   3. Fittings: Hubless cast iron fittings: CISPI 301-05/ASTM A 888-05.
   4. Couplings:
      a. Standard Duty: No-hub couplings meeting CISPI 310 and incorporating ASTM C 564 gasket, type 301 SS corrugated shield and type 301 SS clamping bands. Two clamping bands on 1-1/2" thru 4" pipe and four bands on 6" thru 10" pipe.
      b. Heavy Duty: No-hub couplings meeting ASTM C 1540, and FM 1680. ASTM C 564 neoprene gasket, type 304 SS corrugated shield and type 304 SS clamping bands. Four bands on 1-1/2" thru 4" pipe and 6 bands on 5" thru 10" pipe.
      c. Couplings to Dissimilar Pipe in Concealed Locations: Fernco “ProFlex” with stainless steel outer housing or approved substitute.
   5. Manufacturers: Cast iron pipe and fittings – AB&I, Charlotte Pipe, Tyler Pipe, or approved. All pipe shall be labeled by the manufacturer.

C. Plastic Pipe:
   1. Application:
      a. Above grade where concealed domestic water when continuously supported per specification.
      b. Above grade at seismic joint penetrations.
   2. Pipe:
      a. Cross-linked polyethylene (PEX) tubing manufactured by PEX-a or Engel Method for Water Service: Tested/listed to ASTM E84, ASTM F876 and F877, and CSA B137.5 listed certified to NSF standards 14 and 61. Rated for 100 PSI at 180º F. UPONOR, AQUAPEX or approved.
   3. Fittings: ASTM F1960 cold expansion fittings. Provide fittings of the type matching piping manufacture and recommended by the piping manufacturer for the service indicated.

2.02 MISCELLANEOUS PIPING MATERIALS

A. Insulating (Dielectric) Fittings: See Section 3.

B. Drains:
   1. Zurn, Jay R. Smith, Josam, Watts, Wade and Mifab are approved. Numbers scheduled on drawings represent minimum acceptable standard for locations involved.
   2. Cast iron construction with acid resistant coating, anchor flange, and other options as indicated by model number.
   3. Install 4 pound sheet lead flashing, extending not less than 10" from and clamped to all drains not completely cast-in-place in a homogeneous material.

C. Soldering and Brazing Materials: Provide soldering materials as determined by the installer to comply with installation requirements.
   1. Tin-Antimony Solder: ASTM B32, Grade 95TA.
   2. Lead-Free Solder: ASTM B32, Grade HB. Harris “Bridgit” approved.
   3. Silver Solder: ASTM B32, Grade 96.5TS.
   4. Flux: Water soluble paste flux.
   5. Brazing filler rod: BCuP rod to suit conditions.

D. Wall Cleanouts: Smith 4472-U, bronze ferrule with raised head bronze plug, stainless steel shallow cover and vandalproof screws.

PART 3 EXECUTION

3.01 UTILITY SERVICE

A. Water Service: Connect to water system.

3.02 PIPE INSTALLATION

A. General: Install pipe, tube and fittings in accordance with recognized industry practices and plumbing code standards. Install each run accurately aligned with a minimum of joints and couplings. Provide necessary support.

3.03 PIPING JOINTS

A. General: Provide joints of the type indicated in each piping system, and where piping and joint as manufactured form a system, utilize only that manufacturer's material.

B. Solder Copper Tube and Fitting Joints: In accordance ANSI B 828 with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in a manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. “T-Drill” field formed tees may be utilized where the main is at least two pipe sizes larger than the branch.

C. Braze Copper Tube and Fitting Joints: Where indicated. Pass a slow stream of dry nitrogen gas through the tubing at all times while brazing to eliminate formation of copper oxide.

D. Cast Iron “No-Hub”: All joints in accordance with the Cast Iron Soil Pipe Institute (CISPI) Designation No. 310-97 “Installation Procedures for Hubless Cast Iron Soil Pipe and Fittings For Sanitary and Storm Drain, Waste and Vent Piping Applications.” Horizontal runs of 5" and greater shall be braced as indicated in Figure 4 for “rodding” restraints. Application of couplings as follows:
   1. Standard Duty Couplings: All vent piping and all drainage and waste piping above grade.
   2. Heavy Duty Couplings: All underground waste installations and any storm drain installations 2 stories or more in height.

E. Insulating (Dielectric) Fittings: Use brass valve or brass nipple with length/nominal diameter ratio of 8 or greater rather than dielectric fitting.

F. Changes in Direction: Use fittings for all changes in direction. Run lines parallel with building surfaces.

G. Unions and Flanges: At all equipment to permit dismantling and elsewhere as consistent with good installation practice.

H. Expansion: Provide loops, swing joints, anchors, runouts and spring pieces to prevent damage to piping or equipment.

3.04 MISCELLANEOUS PIPING EQUIPMENT

A. Floor, Wall and Ceiling Plates: Chrome plated pressed steel or brass screw locked split plates on all pipe penetrations in finished spaces.

3.05 CLEANING

A. General: Clean all dirt and construction dust and debris from all mechanical piping systems and leave in a new condition. Touch up paint where necessary.

3.06 TEST

A. General:
   1. Minimum duration of two hours or longer, as directed for all tests. Furnish report of test observation signed by qualified inspector. Make all tests before applying insulation, backfilling, or otherwise concealing piping or connecting fixtures or equipment. Where part of the system must be tested to avoid concealment before the entire system is complete, test that portion separately, same as for entire system.
   2. Provide all necessary temporary equipment for testing, including pump and gauges. Remove control devices before testing and do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for the indicated pressure and time.
   3. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.

B. Repair:
   1. Repair piping system sections which fail the required piping test by disassembly and re-installation, using new materials to the extent required to overcome leakage. Do not use chemical stop-leak compounds, solder, mastics, or other temporary repair methods.
   2. Drain test water from piping systems after testing and repair work has been completed.

C. Water Piping: Hydrostatic pressure of 100 psig without loss for four hours.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The provisions of the General Requirements, Supplementary Requirements, and Division 1 apply to the HVAC work specified in this Division.

B. The requirements of this Section apply to the HVAC systems specified in these Specifications and in other Division 23 sections.

C. Provide all items, articles, materials, equipment, operations and/or methods listed, mentioned, shown and/or scheduled on the Drawings and/or in these Specifications, including all labor, supervision, services, permits, fees, and incidentals necessary and required to provide a complete and operable facility with complete systems as shown, specified, and required by applicable codes.

D. The work shall include, but not be limited to, the following systems:
   1. Revisions to the existing HVAC system as required for structural and seismic upgrades.

E. Advise subcontractor, suppliers, and vendors involved in the work specified in this Section of the applicable requirements.

1.02 QUALITY ASSURANCE

A. All work and materials shall conform to all applicable local and state codes and all federal, state and other applicable laws and regulations. All clarifications and modifications which have been cleared with appropriate authorities are listed under the applicable sections. All electrical products shall bear the label of a recognized testing laboratory such as UL or CSA.

B. Whenever the requirements of the Specifications or Drawings exceed those of the applicable code or standard, the requirements of the Specifications and Drawings shall govern.

C. Codes and Standards: Comply with the provisions of the following referenced codes, standards and specifications:
   1. Federal Specifications (FS)
   2. American National Standards Institute (ANSI)
   3. National Electrical Manufacturer's Association (NEMA)
   4. National Fire Protection Association (NFPA)
   5. Underwriters Laboratories, Inc. (UL)
   6. Factory Mutual (FM)
   7. International Building Code (IBC) with State and Local Amendments
   8. International Mechanical Code (IMC) with State and Local Amendments
   9. Uniform Plumbing Code (UPC) with State and Local Amendments
   10. American Society for Testing and Materials (ASTM)
   11. Americans with Disabilities Act (ADA)
   12. International Fire Code (IFC) with State and Local Amendments
   13. Energy Policy Act (EPAct)
   14. Manufacturers Standardization Society (MSS)
   15. American Gas Association (AGA)

D. Each piece of equipment furnished shall meet all detailed requirements of the Drawings and Specifications and shall be suitable for the installation shown. Equipment not meeting all requirements will not be acceptable, even though specified by name. Where two or more units of the same class of equipment are furnished, use product of the same manufacturer; component parts of the entire system need not be products of same manufacturer. Furnish all materials and equipment, new and free from defect and of size, make, type and quality herein specified or approved by the Architect. All materials shall be installed in a neat and professional manner.

E. All apparatus shall be built and installed to deliver its full rated capacity at the efficiency for which it was designed.

F. The Drawings and Specifications are complementary. What is called for by one shall be as though called for by both.

G. Drawings: Do not scale Drawings for roughing-in measurements, nor use as shop Drawings. Make field measurements and prepare shop Drawings. Coordinate work with shop Drawings of other specification divisions.

H. Field Wiring: It is the intent of these specifications that all systems shall be complete and operable. Refer to all Drawings and specifications, especially the electrical Drawings, to determine voltage, phase, circuit ampacity and number of connections provided. Provide all necessary field wiring and devices from the point of connection indicated on the electrical drawings. All equipment shall be installed in compliance with the Electrical Code and the equipment's UL listing. Bring to the attention of the Architect in writing, all conflicts, incompatibilities, and/or discrepancies prior to bid or as soon as discovered.

1.03 WORK OF OTHER DIVISIONS

A. Work under this Division shall be conducted in a manner to cooperate with the installation of such equipment or items as specified in other Divisions.

B. Plumbing piping systems and fixtures and fire suppression piping systems are specified under other Divisions of these Specifications except for provisions or items specifically noted on the Drawings or specified herein.

C. Consult all Drawings and Specifications in this project and become familiar with all equipment to be installed. Coordinate all aspects of the construction with the other trades on the job to ensure that all work and materials required to provide a complete and operational facility are included in the bid.

D. All sections of Division 23 are interrelated and shall be considered in their entirety when interpreting any material, method, or direction listed in any section of Division 23. Individual sections are not written for specific Subcontractors or suppliers but for the General Contractor.

E. Where Drawings say to provide materials the subject materials are to be provided and installed.

1.04 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES (SUBMITTALS)

A. Submit in accordance with Division 1 full technical and descriptive shop drawing data on proposed materials and equipment as detailed in each section.

B. The Contractor shall verify that all equipment submitted can be delivered and installed within the time constraints of the construction period.

C. Include the manufacturer, type, style, catalog number, complete specification, certified dimensions, and description of physical appearance for each item and option submitted. Reproduction of catalog data sheets shall be clean and legible to show all details, including gauge of metal used.

D. Include only information on exact equipment to be installed, not general catalogs of the manufacturer. Where sheets show proposed equipment as well as other equipment, identify proposed equipment with rubber stamp arrow or similar concise method.

E. Submit with each copy a transmittal letter verifying that all included equipment submittals have been carefully considered for quality, dimensions, function, and have been coordinated with the Drawings and Specifications. Guarantee that proposed materials will meet or exceed the quality and function of those specified.

F. Include field wiring diagrams and connection diagrams for all control and/or low voltage systems, including floor plans.

G. Submittal Review: The submittal review process is a means to provide quality control. The action noted to be taken (or where conflicts with the contract documents are not noted) shall not be interpreted by the Contractor as automatic “change orders.” Approval of the data for substitution and shop drawings shall not eliminate the Contractor’s responsibility for compliance with Drawings or Specifications, nor shall it eliminate the responsibility for freedom from errors of any sort in the data discovered prior to or after the review process. Deviations, discrepancies, and conflicts between the submittals and the Contract Documents shall be called to the Architect's attention in writing at the time of transmittal of the data.

H. Submittals shall be in the form of PDF documents. Arrange submittals numerically with specification sections identified in tabs. All required sections shall be submitted at one time. Partial submittals will be rejected without review.

I. For adhesives and sealants used on the interior of the building (inside the waterproofing system), include printed statement of volatile organic compound (VOC) content.

1.05 PRODUCT SUBSTITUTION

A. Materials other than those specified may be approved for this project providing a written request is submitted to the Architect prior to bid in accordance with Instructions to Bidders. Requests shall include complete specifications, dimensions, manufacturer and catalog number for each item for which approval is desired. If, in the opinion of the Architect, the material is not complete or if it is not an acceptable substitute, he may reject it. The Architect's evaluation will be based solely on the material submitted.

1.06 CHANGE ORDERS

A. All supplemental cost proposals by the Contractor shall be accompanied by a complete itemized breakdown of labor and materials without exception. At the Architect's request, the Contractor's estimating sheets for the supplemental cost proposals shall be made available to the Architect. Labor must be separated and allocated for each item of work.

1.07 RECORD DOCUMENTS

A. Project Record (As-Installed) Drawings:
   1. Maintain a set of record drawings on the job site as directed in Division 1.
   2. Keep Drawings clean, undamaged, and up to date.
   3. Record and accurately indicate the following:
      a. Depths, sizes, and locations of all buried and concealed piping dimensioned from permanent building features.

b. Locations of all valves with assigned tag numbers.
c. Locations of all fire dampers and other airflow control devices.
d. Changes, additions, and revisions due to change orders, obstructions, etc. Eradicate extraneous information.
e. Model numbers of installed equipment.

4. Make Drawings available when requested by Architect for review.
5. Submit as part of the required Project Closeout documents. Final submittal will be in the form of reproducible drawings.
6. Quality of entire set of project record drawings to match the quality of the contract documents; quality to be judged by Architect. Computer-aided design drafting (CADD) shall be used to complete project record drawings. Use standards set in contract documents. Note field modifications, all addenda, and change order items on project record drawings. If deficiencies are found in either the quality or the accuracy of the drawings, they will be returned unapproved. Additional review of subsequent submissions shall be at the Contractor's expense.

1.08 WARRANTY

A. Furnish, prior to application for final payment, three copies of written and signed guarantee effective a period of one year from date of completion and acceptance of entire project; agree to correct, repair and/or replace defective materials and/or equipment or the results of defective workmanship without additional expense to the Owner. Where no response satisfactory to the Owner has occurred within three working days from the written report of a warranty covered defect, the Contractor shall agree to pay for the cost of repair of the reported defect by a Contractor of the Owner's choice.

B. Where the manufacturer's guarantee exceeds one year, the longer guarantee shall govern and include the Contractor's labor.

PART 2 PRODUCTS

2.01 GENERAL

A. General: Provide all new materials and equipment, identical to apparatus or equipment in successful operation for a minimum of two years. Provide materials of comparable quality omitted here but necessary to complete the work. Maximum allowable variation from stated capacities, minus 5% to plus 10% as approved in each case.

B. Compatibility: Provide products which are compatible with other portions of the work and provide products with the proper or correct power and fuel-burning characteristics, and similar adaptations for the project.

C. Efficiency: Heating and cooling equipment shall comply with ASHRAE Standard 90.1-2016 and the State Energy Code. Where equipment efficiencies are indicated, the use of alternate or substitute manufacturer's equipment with lower efficiencies is not permitted.

D. Storage and Handling:
1. Delivery: Deliver to project site with manufacturer's labels intact and legible.
2. Handling: Avoid damage.
3. Storage: Inside protected from weather, dirt and construction dust. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

2.02 HANGERS AND SUPPORTS

A. General: Provide factory-fabricated horizontal piping hangers, clamps, hanger rod, inserts, supports, etc., of the indicated MSS type and size. The Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry Practice SP-58 and SP-69 are referenced in this section.

B. Manufacturers: B-Line, Carpenter & Paterson, Grinnell, Michigan, Superstrut, Tolco, Erico, or accepted substitute. Grinnell figure numbers in parentheses where applicable (or other manufacturers as noted).

C. Corrosion Protection: Provide materials which are zinc plated or factory painted to prevent corrosion. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated, plastic coated, or by other recognized industry methods.

D. Seismic Requirements: Provide seismic restraints in accordance with OSSC Section 1613. Design restraint systems in accordance with "Seismic Restraint Manual: Guidelines for Mechanical Systems," Second Edition, 1998, SMACNA, or "A Practical Guide to Seismic Restraint" ASHRAE RP-812, 1999. See Structural for Seismic Importance Factor.

E. Horizontal Piping Hangers and Supports:
1. Adjustable Clevis Hanger: MSS Type 1 (Fig. 260).
2. Adjustable Band Hanger: MSS Type 7 (Fig. 97), fabricated from steel.
3. Adjustable Swivel-Band Hanger: MSS Type 10 (Fig. 70).
4. Clamp: MSS Type 4 (Fig. 212, 216).
5. Double-Bolt Clamp: MSS Type 3 (Fig. 295A, 295H), including pipe spacers.
6. Adjustable Saddle-Support: MSS Type 36 (Fig. 258) and MSS Type 37 (Fig. 259), including saddle, pipe and reducer. Fabricate base-support from steel pipe and include cast-iron flange or welded-steel plate.
7. Channel Support System: Galvanized, 12 gauge channel and bracket support systems, single or double channel as indicated on the Drawings or as required by piping and equipment weights. Grinnell "Power Strut" channel. Acceptable Manufacturers: Super Strut, Globestrut, Bee, Kindorf or Unistrut.

F. Vertical Pipe Clamps:
1. Two-Bolt Riser Clamp: MSS Type 8 (Fig. 261).
2. Four-Bolt Riser Clamp: MSS Type 42 include pipe spacers at inner bolt-holes.

G. Hanger Attachment:
1. Hanger Rod: Rolled threads, zinc plated. Right hand threaded.
2. Turnbuckles: MSS Type 13 (Fig. 230).
3. Weldless Eye-Nut: MSS Type 17 (Fig. 290).
4. Malleable Eye-Socket: MSS Type 16 (Fig. 110R).
5. Clevises: MSS Type 14 (Fig. 299).

H. Building Attachments:
1. Concrete Inserts: MSS Type 18 (Fig. 282), steel or Grinnell Power-Strut PS349 continuous channel. Acceptable Manufacturers: Michigan Hanger, Globestrut, Unistrut, Super Strut.
2. Clamps: MSS Type 19 (Fig. 285, 281), Type 20, 21 (Fig. 225, 226, 131), Type 23 (Fig. 86, 87, 88), Type 25 (Fig. 227), Type 27 through 30 where applicable.

PART 3 EXECUTION

3.01 LAYOUT AND COORDINATION

A. Site Examination: Before starting work, carefully examine site and all contract Drawings. Become thoroughly familiar with conditions governing work on this project. Verify all indicated elevations, building measurements, roughing-in dimensions and equipment locations before proceeding with any of the work.

B. Utility Locations: The location of existing utilities, wires, conduits, pipes, ducts, or other service facilities are shown in a general way only on the Drawings and are taken from existing records. Ascertain whether any additional facilities other than those shown on the plans may be present and determine the exact location and elevations of all utilities prior to commencing installation.

C. Coordination:
   1. The Drawings are based on equipment of a certain manufacturer and may be identified as such. Where alternate manufacturers or approved substitutes are incorporated into the work, any required design changes are the responsibility of the Contractor. Such changes may include changes in utility or system connection sizes, location, or orientation, service clearances, structural support or acoustic considerations.
   2. Prepare accurate AutoCAD shop drawings showing the actual physical dimensions required for the installation for duct work, piping and mechanical devices. Submit drawings prior to purchase/fabrication/installation of any of the elements involved in the coordination. Provide drawing files to other trades for coordination.
   3. Cooperate with other trades in furnishing material and information for sleeves, bucks, chases, mountings, backing, foundations and wiring required for installation of mechanical items.
   4. Coordinate all work with other trades and determine in advance where interfacing of the mechanical work and other work are required to be connected together. Provide all materials and equipment to make those connections. Submit shop drawings showing required connections where special conditions exist.

D. Discrepancies: Report immediately any error, conflict or discrepancy in Plans, Specifications and/or existing conditions. Do not proceed with any questionable items of work until clarification of same has been made. Should rearrangement or re-routing of piping be necessary, provide for approval the simplest layout possible for that particular portion of the work.

3.02 GENERAL INSTALLATION

A. Locating and Positioning Equipment: Observe all Codes, Regulations and good common practice in locating and installing mechanical equipment and material so that completed installation presents the least possible hazard. Maintain adequate clearances for repair and service to all equipment and comply with Code requirements.

B. Adjusting: Ensure control devices work similar to operation prior to construction.

3.03 INSTALLATION OF HANGERS AND SUPPORTS

A. General: Proceed with the installation of hangers, supports and anchors only after the required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) the proper placement of inserts, anchors and other building structural attachments.
   1. Install hangers, supports, clamps, and attachments to support piping and equipment properly from the building structure. Use no wire or perforated metal to support piping, and no supports from other piping or equipment. For exposed continuous pipe runs, install hangers and supports of the same type and style as installed for adjacent similar piping.
   2. Prevent electrolysis in the support of copper tubing by the use of hangers and supports which are copper plated or by other recognized industry methods.
   3. Arrange supports to prevent eccentric loading of joists and joist girders. Locate supports at panel points only.

B. Provisions for Movement:
   1. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate the action of expansion joints, expansion loops, expansion bends and similar units. Install specified seismic restraints to restrict excessive movement.
   2. Install hangers and supports so that equipment and piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

3. Install hangers and supports to provide the indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 are not exceeded. Comply with the following installation requirements:
   a. Clamps: Attach clamps, including spacers (if any), to piping outside the insulated piping support. Do not exceed pipe stresses allowed by ANSI B31.
   b. Insulated Pipe Supports: Insulated pipe supports shall be supplied and installed on all insulated pipe and tubing.
   c. Load Rating: All insulated pipe supports shall be load rated by the manufacturer based upon testing and analysis in conformance with ASME B31.1, MSS SP-58, MSS SP-69 and MSS SP-89.
   d. Support Type: Manufacturer's recommendations, hanger style and load shall determine support type.
   e. Insulated Piping Supports: Where insulated piping with continuous vapor barrier or where exposed to view in finished areas is specified, install hard maple wood insulation shields (Elcen Fig. 216) or steel pipe covering protection shields (MSS type 39) at each hanger.

C. Pipe Support:
   1. Vertical Spacing: Support at base, at equivalent of every floor height (maximum 10' as required by Code) and just below roof line.
   2. Screwed or Welded Steel or Copper Piping: Maximum hanger spacing shall be as follows:

	Steel	Copper
1-1/4" and smaller	7' span	6' span
1-1/2" pipe	9' span	6' span
2" pipe	10' span	10' span
2-1/2" & larger	12' span	10' span

   3. Install additional hangers or supports at concentrated loads such as pumps, valves, etc. to maintain alignment and prevent sagging.
   4. Support Rod: Hanger support rods sized as follows:

Pipe and Tube Size		Rod Size	
Inches	mm	Inches	mm
1/2" to 4"	12.7 to 101.6	3/8"	9.5
5" to 8"	127.0 to 203.2	1/2"	12.7
10" to 12"	254.0 to 304.8	5/8"	15.9

D. Adjust hangers and supports to bring piping to proper levels and elevations.

E. Provide all necessary structural attachments such as anchors, beam clamps, hanger flanges and brackets in accordance with MSS SP-69. Attachments to beams wherever possible. Supports suspended from other piping, equipment, metal decking, etc., are not acceptable.

F. Horizontal banks of piping may be supported on common steel channel member spaced not more than the shortest allowable span required on the individual pipe. Maintain piping at its relative lateral position using clamps or clips. Allow lines subject to thermal expansion to roll axially or slide. Size channel struts for piping weights.

G. Installation of drilled-in concrete anchors shall comply with the manufacturer’s instructions for working load, depth of embedment, and spacing between anchors and from the edge of the slab. Use only wedge-style anchors.

H. Seismic Restraints: Install restraints where recommended in SMACNA “Seismic Restraint Manual” and as required by code. Show analysis of supporting structure, anchorages, and restraints in accordance with OSSC Section 16 and reference ASCE standard. Seismic restraint system components shall be approved by the California Office of Statewide Health Planning and Development (OSHPD). Acceptable Manufacturers: Amber/Booth, Mason Industries, Tolco, or approved. Contractor shall submit calculations and shop drawings, sealed and signed by a Professional Engineer, showing seismic restraint design for all equipment, piping and ductwork required to be braced.

3.04 PROTECTION

A. Protect all work and materials against loss or damage. Close all pipe openings with caps or plugs. At final completion, thoroughly clean and deliver all work and equipment in an unblemished new condition. Keep all motors and bearings in watertight and dustproof covers during entire course of installation.

B. Protect floors, walls, framing and sheathing where pipe cutting and threading operations are conducted with plastic sheeting under plywood sheets. Extend plastic sheeting beyond the plywood. Clean-up metal cuttings, oil, etc., daily or as necessary to prevent debris from being tracked beyond the protected area. Damages, as determined by the Architect, due to the pipe cutting/threading operation shall be repaired by the responsible trade.

3.05 CUTTING AND PATCHING

A. General: Comply with the requirements of Division 1 for the cutting and patching of other work to accommodate the installation of mechanical work. Do all necessary cutting and patching of existing building and yard surfaces required for completion of the mechanical work. Patch to match finish and color of adjacent surfaces. Coordinate work in remodel and new areas to avoid cutting of new finished surfaces.

3.06 MECHANICAL PAINTING

A. See Section 09 90 00 for Materials and Requirements.

3.07 HVAC WORK CLOSEOUT

A. General: Refer to the Division 1 sections for general closeout requirements. Calibrate all equipment requiring same. Complete each system as shown or specified herein and place in operation except where only roughing-in or partial systems are called for. Each system shall be tested and left in proper operation free of leaks, obstructions, or contamination.

B. Record Drawings: Submit record set of drawings required in Division 1 as previously specified in this Section.

C. Closeout Equipment/Systems Operations: Sequence operations properly so that work of project will not be damaged or endangered. Coordinate with seasonal requirements. Operate each item of equipment and each system in a test run of appropriate duration with the Architect present, and with the Owner's operating personnel present, to demonstrate sustained, satisfactory performance. Adjust and correct operations as required for proper performance. Clean and lubricate each system and replace dirty filters, excessively worn parts and similar expendable items of the work.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the insulation of mechanical equipment specified elsewhere in these specifications.

B. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Insulation Thickness and Thermal Performance: Comply with provisions of the State of Oregon Energy Code.

B. Composite (Insulation, Jacket or Facing and Adhesives) Fire and Smoke Hazard Ratings: Not to exceed a flame spread of 25 or smoke development of 50 and containing less than 0.1% by weight deca-PDE fire retardant.

C. Component Ratings of Accessories (Adhesives, Mastics, Cements, Tapes, Finishing Cloth for Fittings): Same as “B” requirements above and permanently treated. No water soluble treatments.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: In addition to the requirements specified in Section 23 05 00, the following apply:
   1. Deliver insulation, coverings, cements, adhesives and coatings to the site in factory-fabricated containers with the manufacturer's stamp or label affixed showing fire hazard ratings of the products. Store insulation in original wrappings and protect from weather and construction traffic.
   2. Protect insulation against dirt, water, chemical and mechanical damage. Do not install damaged insulation. Remove such insulation from project site.

1.04 SUBMITTALS

A. Submit catalog data and performance characteristics for each product specified.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Insulating Manufacturers: Johns Manville, Knauf, Armstrong, Owens-Corning, Pittsburgh Corning, Pabco, Imcoa or Certain Teed. Johns Manville products are listed unless indicated otherwise.

B. Adhesive Manufacturers: Foster, 3M, Insul-Coustic, Borden, Kingco or Armstrong.

2.02 PIPING INSULATION

A. Interior and Exterior Piping Systems 50 to 850 Deg. F: Glass fiber preformed pipe insulation with a minimum K-value of 0.23 at 75 Deg. F, a minimum density of 3.5 pounds per cubic foot within all-service vapor barrier jacket, vinyl or pre-sized finish and pressure sensitive seal containing less than 0.1% by weight deca-PDE fire retardant.

2.03 INSULATION ACCESSORIES

A. Insulation Compounds and Materials: Provide rivets, staples, bands, adhesives, cements, coatings, sealers, welded studs, etc., as recommended by the manufacturers for the insulation and conditions specified except staples not permitted on chilled water lines.

B. PVC Protective Jacketing and Valve and Pipe Fitting Covers: Johns Manville Zeston 2000, Proto LoSmoke, or Ceel-Co Ceel-Tite 100 Series with precut fitting fiberglass insulation or approved.

C. Jacket Lap Sealing Adhesives: Foster Drion 85-75 contact cement or approved substitute.

D. Saddles and Shields: Unless otherwise indicated and except as specified in piping system specification sections, install the following types:
   1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
   2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
   3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100-psi (690-kPa) minimum compressive strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

2.04 DUCT INSULATION

A. Interior Above Grade Ductwork: Glass fiber formaldehyde-free blanket with “FSK” facing containing less than 0.1% by weight deca-PDE fire retardant, k value = 0.31 at 75 deg. F, 0.2 perms, and UL 25/50 surface burning rating. Johns Manville “Microlite.”

B. No interior duct lining permitted in this project.

PART 3 EXECUTION

3.01 PIPING INSULATION

A. Heating Water Piping: Insulate with glass fiber pipe covering:

Size	Thickness
1/2" to 1-1/2"	1-1/2"
2" to 3"	2"
4" and larger	2-1/2"

B. Pipe Fittings:
   1. Insulate and finish all fittings including valve bodies, bonnets, unions, flanges and expansion joints with precut fiberglass insulation and preformed PVC covers sealed to adjacent insulation jacket for continuous vapor barrier covering over all fittings.
   2. Provide removable/reusable insulation covers on 4" and larger valves, unions, flanges, pump casings, strainers and similar fittings or equipment requiring periodic service.

C. Protective Covering: Install continuous protective PVC or metal covering on all piping and fittings in mechanical rooms below 8’ AFF, and where insulation may be subject to damage. Install continuous protective PVC covering on all piping and fittings exposed in Halls, Classrooms, or any occupied space where not covered with metal chase. Install with rivets or cement seams and joints.

D. Insulated Piping: Comply with the following.
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits according to ASME B31.9.
   2. Install MSS SP-58, Type 39 or Type 40 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

a. Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN100) and larger if pipe is installed on rollers.

3. Shield Dimensions for Pipe: Not less than the following.
   a. NPS 1/4 to NPS 3-1/2 (DN8 to DN90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN125 and DN150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 and NPS 14 (DN200 and DN350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 and NPS 24 (DN400 and DN600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
4. Pipes NPS 8 (DN200) and Larger: Include wood inserts.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

E. Piping Insulation Lap Seams and Butt Joints: Install insulation jacket in accordance with manufacturer's recommendation. Where jacket joint and lap seams have not adhered, remove affected section of insulation and reinstall or apply lap sealing adhesive in accordance with manufacturer's instructions.

3.02 DUCTWORK INSULATION

A. Interior Above Grade Ductwork: Glass fiber formaldehyde-free blanket with "FSK" facing containing less than 0.1% by weight deca-PDE fire retardant, k value = 0.31 at 75 deg. F, 0.2 perms, and UL 25/50 surface burning rating. Johns Manville "Microlite."

B. Below Grade Ductwork: Insulate with foamed-in-place urethane insulation.

C. Exterior Above Grade Ductwork: Glass fiber board with “FSK” facing containing less than 0.1% by weight deca-PDE fire retardant, 3 pound density, k value of 0.23 at 75 deg. F and 0.2 perms. Install with 0.016" aluminum jacket. Johns Manville 800 Series Spin-Glas.

D. No interior duct lining permitted in this project.

PART 3 EXECUTION

3.01 PIPING INSULATION

A. Heating Water Piping: Insulate with glass fiber pipe covering:

Size	Thickness
1/2" to 1-1/2"	1-1/2"
2" to 3"	2"
4" and larger	2-1/2"

B. Runout piping not exceeding 4 feet in length and 1” diameter between the control valve and the HVAC coil connections shall be insulated with minimum 1/2” thick glass fiber pipe covering.

C. Pipe Fittings:
   1. Insulate and finish all fittings including valve bodies, bonnets, unions, flanges and expansion joints with precut fiberglass insulation and preformed PVC covers sealed to adjacent insulation jacket for continuous vapor barrier covering over all fittings.
   2. Use 1/2" thick Armaflex or Aerotube foamed plastic at flexible pipe connections on chilled and/or cold water lines. No insulation on other flexible pipe connections.
   3. Provide removable/reusable insulation covers on 4" and larger valves, unions, flanges, pump casings, strainers and similar fittings or equipment requiring periodic service.

D. Protective Covering: Install continuous protective PVC or metal covering on all piping and fittings in mechanical rooms, accessible tunnels, attic spaces, accessible ceilings, etc., where insulation may be subject to damage. Install with rivets or cement seams and joints.

E. Insulated Piping Supports: Where insulated piping with continuous vapor barrier or where exposed to view in finished areas is specified, install hard maple wood insulation shields, insulation inserts, or steel pipe covering protection shields at each hanger.

F. Piping Insulation Lap Seams and Butt Joints: Install insulation jacket in accordance with manufacturer's recommendation. Where jacket joint and lap seams have not adhered, remove affected section of insulation and reinstall or apply lap sealing adhesive in accordance with manufacturer's instructions.

3.02 DUCTWORK INSULATION

A. Ductwork: Insulate the following:
   1. All supply ductwork with cooling.
   2. All supply and return ductwork in systems routed in unconditioned spaces or exposed to the outside conditions.
   3. All outside air intake ducts.
   4. All ductwork required to be insulated by code.

B. Insulation Thickness: Select board and blanket insulation of thickness required to provide the following installed R-value.
   1. All heating or cooling system supply and return ducts located on the exterior of the insulated building envelope, including ventilated attics, and all outside air intake ducts, R-8.
   2. All heating and cooling system supply and return ducts located in unconditioned spaces within the building insulation envelope, R-5.
   3. All heating and cooling system supply ducts located in conditioned spaces and where exposed in unfinished spaces or concealed from view in finished spaces, R-3.3. Exposed ductwork in finished spaces shall not be externally insulated.
   4. Ducts located within or below concrete slabs on grade, R-4.

C. Fittings: Install with wire, straps, and duct adhesive as required. To prevent sagging on all rectangular or square ducts over 24" wide, install Gramweld or equal welding pins on the bottom. Maximum spacing 18" on center in both directions.

D. Installation: Applied with butt joints, all seams sealed with vapor seal mastic or taped with 2" wide vapor-proof, pressure-sensitive tape. Seal all penetrations with vapor barrier adhesive.

E. Internally Lined Ductwork: None permitted.

END OF SECTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Existing Facility consists of systems that are on JCI Metasys controllers.

B. Provide all necessary BACnet-compliant hardware and software to meet the system's functional specifications. Provide Protocol Implementation Conformance Statement (PICS) for Windows-based control software and every controller in system, including unitary controllers.

C. All controls are to be provided and mounted and wired in the field. Factory supplied controls are not acceptable.

D. Coordinate with Electrical Contractor who is to furnish and install conduit, wire, branch circuit protection, etc. as required to bring 120 VAC power to control panel locations and equipment (actuators, sensors, control devices, etc.) as shown on the drawings and described in the specifications.

E. Prepare individual hardware layouts, interconnection drawings, and software configuration from project design data.

F. Implement the detailed design for all analog and binary objects, system databases, graphic displays, logs and management reports based on control descriptions, logic drawings, configuration data, and bid documents.

G. Design, provide, and install all equipment cabinets, panels, data communication network cables needed, and all associated hardware.

H. Furnish all interconnecting cables between supplied cabinets, application controllers, and input/output devices.

I. Furnish all interconnecting cables between all operator's terminals and peripheral devices supplied under this section.

J. Provide complete manufacturer's specifications for all items that are supplied. Include vendor name of every item supplied.

K. Provide as-built documentation, operator's terminal software, diagrams, and all other associated project operational documentation (such as technical manuals) on approved media, the sum of which accurately represents the final system.

L. Furnish and install a complete sensor, actuator, wiring and piping system for all air handling and related equipment as shown on the plans and specified in this section. Install all necessary sensors and actuators as required by the plans and specifications and equipment schedules. No used components shall be used as any part of or piece of installed system, unless approved by Owner.

M. Commissioning according to commissioning specification, if required by Owner.

N. All line drivers, signal boosters, and signal conditioners etc. shall be provided as necessary for proper data communication.

O. Coordination as required with other sections of the specification for the proper and complete installation of the wiring and tubing system, control devices, dampers, valve, actuators, etc.

P. Furnish and install Direct Digital Control Equipment (DDC) as required by the point list, plans, and specifications including, control units, software, database development, check-out, and debugging. Provide points necessary for a complete and operable system.

Q. Install the sequence of operations specified in the drawings and in this section.

R. Software testing requirements shall include testing in the field of all logic sequences including actual simulation of different processes and events and observing program response to the process or event. All deviations from the requirements of the sequence as specified on the drawings or this specification shall be corrected immediately at no additional cost to the Owner.

S. Provide documentation of software system testing before acceptance testing.

1.02 APPROVED MANUFACTURERS

A. Johnson Controls Facility Explorer installed by Johnson Controls, Spokane, WA.

B, Johnson Controls Facility Explorer installed by Basin Building Solutions in Kennewick, Washington.

1.03 QUALITY ASSURANCE

A. Responsibility: The supplier of the BAS shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished.

B. Component Testing: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Every controller, sensor, and all other DDC components shall be individually tested by the manufacturer prior to shipment.

C. Tools, Testing, and Calibration Equipment: The BAS supplier shall provide all tools, testing, and calibration equipment necessary to ensure reliability and accuracy of the system.

D. The systems control Contractor shall have been in business of minimum of five years and be authorized installing Contractor for the manufacturer of the BACnet components.

E. Control system shall be engineered, programmed and supported completely by representative's local office that must be within 75 miles of project site.

1.04 REFERENCE STANDARDS

A. The latest edition of the following standards and codes in effect and amended as of supplier's proposal date, and any applicable subsections thereof, shall govern design and selection of equipment and material supplied:
   1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
   2. ANSI/ASHRAE Standard 135-2001, BACnet
   3. Uniform Building Code (UBC), including local amendments.
   4. UL 91d Underwriters Laboratories Standard for Energy Management Equipment. Canada and the US.
   5. National Electrical Coe (NEC).
   6. FCC Part 15, Subpart J, Class A
   7. EMC Directive 89/336/EEC (European CE Mark)

B. City, County, State, and Federal regulations and codes in effect as of contract date.

C. Except as otherwise indicated the system supplier shall secure and pay for all permits, inspections, and certifications required for his work and arrange for necessary approvals by the governing authorities.

1.05 SUBMITTALS

A. Drawings
   1. The system supplier shall submit engineering Drawings, control sequence, and bill of materials for approval.
   2. Drawings shall be submitted in the following standard sizes: 11" x 17" (ANSI B).
   3. Four complete digital sets (or as determined by Owner) of submittal drawings shall be provided.
   4. Drawings shall be available on CD-ROM.

B. System Documentation. Including the following in submittal package:
   1. System configuration diagrams in simplified block format.
   2. All input/output object listings and an alarm point summary listing.
   3. Electrical drawings that show all system internal and external connection points, terminal block layouts, and terminal identification.
   4. Complete bill of materials and valve schedule.
   5. Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
   6. Overall system operation and maintenance instructions- including preventive maintenance and troubleshooting instructions.
   7. For all system elements- building controller(s), application controllers, routers, and repeaters, provide BACnet Protocol Implementation Conformance Statements (PICS) as per ANSI/ASHRAE Standard 135-2001.
   8. Provide complete description and documentation of any proprietary (non-BACnet) services and/or objects used in the system.
   9. A list of all functions available and a sample of function block programming that shall be part of delivered system.

C. Project Management
   1. The vendor shall provide a detailed project design and installation schedule integrated with the General Contractor's schedule. Provide coordination as required for all construction phases.

1.06 WARRANTY

A. Warranty shall cover all costs for parts, labor associated travel, and expenses for a period of two years from completion of system acceptance.

B. Hardware and software personnel supporting this warranty agreement shall provide on-site or off-site service in a timely manner after failure notification to the vendor. The maximum acceptable response time to provide this service at the site shall be 24 hours Monday-Friday, 48 hours on Saturday and Sunday.

C. This warranty shall apply equally to both hardware and software.

1.07 RELATED WORK IN OTHER SECTION

A. Refer to Division 0 and Division 1 General Requirements for related contractual requirements.

B. Refer to Section 23 05 00 HVAC Materials & Methods for General Mechanical Provisions.

C. Refer to Section 26 05 00 Common Work Results for Electrical for General Electrical Provisions.

PART 2 PRODUCTS

2.01 VAV BOX CONTROLLERS- SINGLE DUCT

A. BACnet Application Controller - VAV Box
   1. Provide one native BACnet application controller for each VAV box that adequately covers all objects listed in object list for unit. All controllers shall interface to building controller via MS/TP LAN using BACnet protocol. No gateways shall be used. Controllers shall include on board CFM flow sensor, inputs, outputs, and programmable, self-contained logic program as needed for control of units.

B. BACnet Conformance
   1. Application controllers shall as a minimum support MS/TP BACnet LAN types. They shall communicate directly via this BACnet LAN at 9.6, 19.2, 38.4, and 76.8 Kbps, as a native BACnet device. Application controllers shall be of BACnet conformance class 3 and support all BACnet services necessary to provide the following BACnet functional groups:
      a. Files Functional Group
      b. Reinitialize Functional Group
      c. Device Communications Functional Group

C. BACnet Functional Groups
   1. Please refer to Section 22.2, BACnet Functional Groups, in the BACnet Standard, for a complete list of the services that must be directly supported to provide each of the functional groups listed above. All proprietary services, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

D. BACnet Object Types
   1. Standard BACnet object types supported shall include as a minimum- Analog Input, Analog Output, Analog Value, Binary Input, Binary Output, Binary Value, Device, File and Program Object Types. All proprietary object types, if used in the system, shall be thoroughly documented and provided as part of the submittal data. All necessary tools shall be supplied for working with proprietary information.

E. BACnet Universal Inputs
   1. Application controllers shall include universal inputs with 10-bit resolution that can accept 3K and 10K thermistors, 0-5 VDC, and dry contact signals. Inputs on controller may be either analog or digital. Controller shall also include support and modifiable programming for interface to intelligent room sensor with digital display. Controller shall also include binary outs on board. For applications using variable speed parallel fans, provide a single analog output selectable for 0-10 V or 0-20 mA control signals. Application controller shall include microprocessor driven flow sensor for use in pressure independent control logic. All boxes shall be controlled using pressure independent control algorithms and all flow readings shall be in CFM (LPS if metric).

F. BACnet Board Application Controller
   1. All program sequences shall be stored on board application controller in EEPROM. No batteries shall be needed to retain logic program. All program sequences shall be executed by controller 10 times per second and shall be capable of multiple ID loops for control of multiple devices. Programming of application controller shall be completely modifiable in the field over installed BACnet LANs or remotely via modem interface. Operator shall program logic sequences by graphically moving function blocks on screen and typing blocks together on screen. Application controller shall be programmed using the same programming tool as Building Controller and as described in Operator workstation section. All programming tools shall be provided as part of the system.

G. BACnet Intelligent Room Sensor

1. Application controller shall include support for intelligent room sensor. Display on room sensor shall be programmable at application controller and include an operating mode and field service mode. All button functions and display data shall be programmable to show specific controller data in each mode based on which button is pressed on the sensor. See sequence for specific display requirements for intelligent room sensor.

H. Flow Sensor
1. On board flow sensor shall be microprocessor driven and pre-calibrated at the factory. Pre-calibration shall be at 16 flow points as a minimum. All factory calibration data shall be stored in EEPROM. Calibration data shall be field adjustable to compensate for variations in VAV box type and installation. All calibration parameters shall be adjustable through intelligent room sensor. Operator workstation, portable computers and special hand-held field tools shall not be needed for field calibration.

I. Duct Temperature Sensor
1. Provide duct temperature sensor at discharge of each VAV box that is connected to controller for reporting back to operator workstation.

2.02 SENSORS

A. All sensing inputs shall be provided industry standard signals.

B. Temperatures, humidity's, differential pressure signals, and all other signal inputs shall be industry standard variable voltage or amperage.

C. All signal inputs shall be compatible with controllers used and with requirement for readout of variables as specified.

D. If sensors are not linear, then software will linearize sensor output.

E. Controls and sensor for NAV boxes to be provided to VAV manufacturer for installation at the factory.

2.03 TEMPERATURE SENSORS/THERMOSTATS

A. All sensors shall be completely electronic.

B. Duct / Air Handling Unit Type Temperature Sensor (mixed, discharge / supply, and return air).
1. The probe of the duct sensor shall be 12" in length and be made of stainless steel. Applications where the smallest dimension of the duct is less than 24", the probe shall be sized to reach the center of the duct.
2. Large systems above 9 square feet may require an averaging probe if sufficient mixing of the air stream is not possible.
3. Mount the sensor far enough downstream to allow mixing of the air stream, this is most important on Hot and Cold Deck applications where the coil is placed after the fan.
4. Sensors for mounting on insulated ducts or casings are to be equipped with brackets for mounting clear of the isolation.
5. Do not locate sensors in dead air spaces or in positions with obstructed air flow.
6. Provide separate duct flange for each sensing element.
7. Temperature sensing elements shall be thermally isolated from brackets and supports.
8. Securely seal ducts where elements or connections penetrate duct.
9. Mount sensor enclosures to allow for easy removal and servicing without disturbance or removal of duct insulation.

C. Immersion Type Temperature Sensor
1. The probe of the sensor shall be constructed of stainless steel and pressure rating consistent with system pressure and velocity.

2. The well shall be constructed of stainless steel and sized to reach into the center of the pipe. Pipes with small diameters shall have the well mounted at a 90-degree elbow to allow sufficient contact with the fluid.
3. Locate wells to sense continuous flow conditions.
4. Do not install wells using extension couplings.
5. Wells shall not restrict flow area to less than 70 percent of line size pipe normal flow area. Increase piping size as required to avoid restriction.
6. Provide thermal transmission material within the well.
7. Provide wells with sealing nuts to contain the thermal transmission material and allow for easy removal.

D. Room Type Temperature Sensor
1. All thermostat locations shall be submitted for approval before installation.
2. Provide all sensors with blank stainless-steel wall plate.
3. Coordinate sensor location with light switches. Mount blank plate wall sensors 60"above the floor. Mount any sensors with adjustments or readouts at 48" above floor. Verify location before installation, so that no direct sunlight or influences from heat and cooling sources will be imposed on the sensor.
4. Unless otherwise indicated or specified, provide one discharge and one space temperature sensor for each VAV Terminal Control Unit.
5. Metal guards shall be provided as shown on drawings.
6. Insulation shall be installed between the temperature sensor and open conduit to eliminate false temperature readings due to cold drafts.

2.04 AIR PRESSURE SENSORS

A. Static Pressure and Velocity Controllers
1. Static Pressure sensors shall be of either the diaphragm or rigid element bellows, electronic type, photo helic.
2. Each sensor shall be provided with connections, i.e., stop cock tubing, for attaching a portable pressure gauge.
3. Sensors for mounting on insulated ducts or casings are to be equipped with brackets for mounting clear of the insulation.
4. The transmitter shall be a two-wire type and provide a 4-20 mA signal which is proportional and linear over the calibrated pressure range.
5. The transmitter shall be capable of operating from an unregulated 18-30 VDC power supply.
6. The device housing shall provide 1/4" barbed brass fitting for the connection of the pressure lines. Pressure ranges shall suit the application so that normal operation will occur at midrange of the sensor span.
7. The location of the indoor measurement shall be remote from doors and openings to the outside, away from elevator lobbies, and shielded from air velocity effects. See Drawings for location.

2.05 TRANSFORMERS

A. Transformers selected and sized for appropriate VA capacity and installed and fused according to applicable codes.

2.06 RELAYS

A. Coil voltage draw shall not exceed secondary controller output current generation. 24V coil with contacts rated for up to 277V. Controls shall be rated for 20 amps.

2.07 CURRENT SENSORS / TRANSFORMERS

A. The status and amperage of all VFD motors for fan and pumps greater than 20 HP shall be detected using current sensors ONLY.

B. The amp signal shall be provided on operator screen.

C. The scale used must be selected in order to obtain normal operating readings at the mid-point of the scale.

D. The scale used must be selected in order to detect changes in current flow resulting from motor belt or coupling loss. Belt slippage, and other mechanical failures and should be able to distinguish low load conditions.

2.08 ELECTRONIC ACTUATORS AND VALVES

A. Quality Assurance for Actuators and Valves
   1. UL Listed Standard 873 and C.S.A. Class 4813 02 certified.
   2. NEMA 2 rated enclosures for inside mounting, provide with weather shield for outside mounting.
   3. Five-year manufacturer's warranty. Two-year unconditional and three-year product defect from date of installation.

B. Execution Details for Actuators and Valves
   1. Spring actuators are not acceptable by Owner.
   2. Only as specifically required by Owner shall each DDC analog output point shall have an actuator feedback signal, independent of control signal, wired and terminated in the control panel for true position information and troubleshooting. Or the actuator feedback signal may be wired to the DDC as an analog input for true actuator position status. This may apply to chilled heating water plants.
   3. VAV box damper actuation shall be Floating Type or Analog (2-10 VDC, 4-20mA).
   4. Booster-heat valve actuation shall be Floating type or Analog (2-10 VDC, 4-20mA).
   5. Primary valve control shall be analog (2-10 VDC, 4-20mA).

C. Actuators for Damper and Control Valves 1/2" to 6" shall be Electric unless otherwise specified, Provide actuators as follows:
   1. UL Listed standard 873 and Canadian Standards association Class 481302 shall certify actuators.
   2. NEMA 2 rated actuator enclosures. Use additional weather shield to protect actuator when mounted outside.
   3. 5-year Manufacturer's Warranty. Two-year unconditional, plus three-year product defect from date of installation.
   4. No spring return actuators, unless approved by the Owner.
   5. Position indicator device shall be installed and made visible to the exposed side of the Actuator. For damper short shaft mounting, a separate indicator shall be provided to the exposed side of the actuator.
   6. Overload Protection: Actuators shall provide protection against actuator burnout by using an internal current limiting circuit or digital motor rotation sensing circuit. Circuit shall insure that actuators cannot burn out dur to stalled damper or mechanical and electrical paralleling. End switches to deactivate the actuator at the end of rotation are acceptable only for Butterfly Valve actuators.
   7. A push button gearbox release shall be provided for all non-spring actuators.
   8. Modulating actuators shall be 24VAC and consume 10 VA power or less.
   9. Conduit connectors are required when specified and when code requires it.

D. Damper Actuators
   1. No spring return actuators, unless approved by the Owner.
   2. Economizer Actuators shall utilize Analog control 2-10 VDC, Floating control is not acceptable.

3. Electric damper actuators (including VAV box actuators) shall be direct shaft mounted and use a V-bolt and toothed V-Clamp causing a cold weld effect for positive gripping. Single bolt or setscrew type fasteners are not acceptable.
4. Once electronic actuator shall be direct shaft mounted per damper section. No connecting rods or jackshafts shall be needed. Small outside air and return air economizer dampers may be mechanically linked together if one actuator has enough torque to drive both and damper drive shafts are both horizontal installed.
5. Multi -section dampers with electric actuators shall be arranged so that each damper section operates individually. Once electronic actuator shall be direct shaft mounted per damper section (see below execution section for more installation details).

E. Valve Actuators: 1/2" to 6"
1. No spring return actuators, unless approved by the Owner.
2. The valve actuator shall be capable of providing the minimum torque required for proper valve close off for the required application.
3. All control valves actuators shall have an attached 3-foot cable for easy installation to a junction box.
4. Override handle and gearbox release shall be provided for all non-spring return valve actuators.

F. Control Valves 1/2" to 6"
1. The BAS Contractor shall furnish all specified motorized control valves and actuators. BAS Contractor shall furnish all control wiring to actuators. The plumbing Contractor shall install all valves. Equal Percentage control characteristic shall be provided for all water coil control valves. Linear valve characteristic is acceptable for 3-way valves 2 1/2" inch and above.
2. Characterized Control Valves shall be used for hydronic heating or cooling applications and small to medium AHU water coil applications to 100 GPM.
   a. Leakage is Zero Percent, Close-off is 200 psi, Maximum Differential is 30 psi. Rangeability is 500:1.
   b. Valves ½ inch through 2 inches shall be nickel- plated forged brass body, NPT screw type connections.
   c. Valves ½ inch through 1 ¼ inches shall be rated for ANSI Class 600 working pressure. Valves 1 ½ inch and 2 inches shall be rated for ANSI Class 400 working pressure.
   d. The operating temperature range shall be 0° to 250° F.
   e. Stainless steel ball & stem shall be furnished on all modulating valves.
   f. Seats shall be fiberglass reinforced Teflon.
   g. Two-way and three-way valves shall have an equal percentage control port. Full stem rotation is required for maximum flow to insure stable BTU control of the coil.
   h. Three-way valve shall be applicable for both mixing and diverting.
   i. The characterizing disc is made of TEFZEL and shall be keyed and held secure by a retaining ring.
   j. The valves shall have a blowout proof stem design.
   k. The stem packing shall consist of 2 lubricated O-rings designed for on-off or modulating service and require no maintenance.
   l. The valves shall have an ISO type, 4-bolt flange, for mounting actuator in any orientation parallel or perpendicular to the pipe.
   m. A non-metallic thermal isolation adapter shall separate valve flange from actuator.
   n. One fastening screw shall secure the direct coupling of the thermal isolation adapter between the actuator and the valve. This will prevent all lateral or rotational forces from affecting the steam and it’s packing O-rings.
3. Globe vales 1/2" to 2" shall be used for steam control or water flow applications.
   a. Valves shall be bronze body, NPT screw type, and shall be rated for ANSI Class 250 working pressure.

b. Valves ½ inch (DC 15) through 2 inches (DNSO) shall close off against 50 psi pressure differential with Class III leakage (0.1%).
c. The operating temperature range shall be 20° to 280°F.
d. Spring loaded TFE packing shall protect against leakage at the stem.
e. Two-way valves shall have an equal percentage control port.
f. Three-way valves shall have a linear control and bypass port.
g. Mixing and diverting valves must be installed specific to the valve design.

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2.09 ENCLOSURES

A. All controllers, power supplies and relays shall be mounted in enclosures.

B. Enclosures may be NEMA I when located in a clean, dry indoor environment. Indoor enclosures shall be NEMA 12 when installed in other than a clean environment.

C. Enclosures shall have hinged, locking doors.

D. Provide laminated plastic nameplates for all enclosures in any mechanical room or electrical room. Include location and unit served on nameplate. Laminated plastic shall be 1/8" thick sized appropriately to make label easy to read.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to starting work, carefully inspect installed work of other trades and verify that such work is complete to the point where work of this section may properly commence.

B. Notify the Owners representative in writing of conditions detrimental to the proper and timely completion of the work.

C. Do not begin work until all unsatisfactory conditions are resolved.

3.02 INSTALLATION (GENERAL)

A. Install in accordance with manufacturer’s instructions.

B. Provide all miscellaneous devices, hardware, software, interconnections installation and programming required to ensure a complete operating system in accordance with the sequences of operation and point schedules.

3.03 LOCATION AND INSTALLATION OF COMPONENTS

A. Locate and install components for easy accessibility; in general, mount 48 inches above floor with minimum 3’-0" clear access space in front of units. Obtain approval on locations from Owner’s representative prior to installation.

B. All instruments, switches, transmitters, etc., shall be suitably wired and mounted to protect them from vibration, moisture and high or low temperatures.

C. Identify all equipment and panels. Provide permanently mounted tags for all panels.

D. Provide stainless steel or brass thermowells suitable for respective application and for installation under other sections sized to suit pipe diameter without restricting flow.

3.04 INTERLOCKING AND CONTROL WIRING

A. Provide all interlock and control wiring. All wiring shall be installed neatly and professionally, in accordance with Specification Division 26 Electrical and all national, state, and local electrical codes.

B. Provide wiring as required by functions as specified and as recommended by equipment manufacturers, to serve specified control functions. Provide shielded low capacitance wire for all communications trunks.

C. Control wiring shall not be installed in power circuit raceways. Magnetic starters and disconnect switches shall not be used as junction boxes. Provide auxiliary junction boxes as required. Coordinate location and arrangement of all control equipment with the Owner's representative prior to rough-in.

D. Provide auxiliary pilot duty relays on motor starters as required for control function.

E. Provide power for all control components from nearest electrical control panel or as indicated on the electrical drawings. Coordinate with electrical Contractor.

F. All control wiring to be installed neatly and consistently per local code requirements. If local code allows, control wiring above accessible ceiling spaces may be run with plenum rated cable (without conduit).

3.05 WIRING, CONDUIT, AND HANGERS

A. All wiring and fiber optic cable in the central plant, tunnels, and plenums to be supported by B-line Bridle rings or equal. All wiring and fiber optic cable in the hallways, rooms and other public areas shall be in conduit.

B. All wires in Bridle Rings or conduit shall follow building lines and shall run within several inches of the wall as much as possible.

C. Wire and cable of the sizes and types shown on the plans and/or hereinafter specified shall be furnished and installed by the Control Contractor. All wire and cable shall be new soft drawn copper and shall conform to all the latest requirements of the National Electrical Code, IPCEA, and shall meet the specifications of the ASTM.

D. Input/output wiring: Wiring serving inputs and outputs from the BAS shall be cables consisting of single or multiple twisted individually shielded pairs. Each pair shall have an independent shield with drain wire. Cables installed without Condit shall be plenum rated and comply with NEC article 725. Where automation input/output wiring is run in cable tray furnish and install conductors or multiconductor cable rated for use in cable trays per NEC article 340 and/or 725.

E. Power Conductors shall provide power to controls furnished under this section, unless power to controllers is noted on the electrical drawings. Contractor shall coordinate with electrical Contractor to identify dedicated controls circuits. All feeder and branch circuit wire shall be 600 V insulated of THHN type unless shown or specified to be otherwise. No wire less than No. wire less than No. 12 gauge shall be used except for control circuits or low voltage wiring. Wire sizes No. 14 to No. 10 shall be solid except where otherwise indicated. Wire sizes No. 8 and larger shall be stranded. All wire sizes shown are American Wire Gauge sizes. Where power conductors are run in cable tray, furnish and install conductors or multiconductor cable rated for use in cable trays per NEC articles 340 and/or 725.

F. All the conductors used for signals from the controllers and field sensors must be shielded two wire, 18 AWG, with a drain wire.

G. All power wiring to be copper stranded RW 90 type, with appropriate gauge in accordance with the codes. The following color code must be applied:
   1. Line voltage to be black and/or white.
   2. Ground to be green.

H. Wiring Installation
   1. All wires shall be continuous from outlet to outlet and there shall be no unnecessary slack in the conductors.
   2. All drain wires must be grounded at the source end. The other end must be protected with a dielectric material (tape).

I. Pull-Box and Junction Box
   1. Pull boxes and junction boxes shall be installed where indicated on the drawings or where required to facilitate wire installation. Locate in conjunction with other trades to install without conflict with other materials or equipment.
   2. A pull-box will be located at every 50’.
   3. All switch, pull, junction boxes etc., shall be hot dipped galvanized or sherardized, concrete tight, with interlocking ring or multiple point locking devices. Connectors shall be three pieces. Indentation fittings are not acceptable.
   4. In suspended ceilings, all boxes must be installed on the structure.
   5. Boxes shall be attached by fasteners designed for the purpose and shall provide adequate mechanical strength for future maintenance.
   6. Junction and pull boxes not dimensioned shall be minimum 4-inches square.

J. Care shall be used to avoid proximity to heat ducts and/or steam lines. Where crossings are unavoidable, conduit shall clear cover of line by at least six inches.

K. All splices, taps, and terminations shall be made at outlet, junction, or pull boxes. Wire to No. 6 gauge shall be spliced using Scotch Lok wire nuts. No Bakelite wire nuts shall be used. Wire No. 6 and larger shall be spliced using soldemess connectors as manufactured by Penn Union Company. Splices No. 6 and larger shall be insulated by taping with plastic vinyl tape as manufactured by Minnesota Mining and Manufacturing Company. Splices shall not be permitted in automation input and output wiring without specific written authorization from the Engineer. If such splice is approved, the location of the splice shall be clearly documented on the “As Built” drawings. Splices in automation wiring, if necessary shall be made using Thomas & Betts STA-KON connectors installed per the manufacturer’s directions to maintain NEMA specified voltage drops and wire retention forces.

L. Grounding
   1. The Contractor shall extend existing equipment grounding systems. The Contractor shall use only approved grounding clamps and connectors as manufactured by Penn Union, Bumdy or O-Z Mfg. Company.
   2. The conduit system of the 480/277 and 208Y/120-volt systems shall be continuous and shall be used as the static grounding conductor, except for circuits installed in flexible conduit. Install a green grounding conductor inside all flexible conduits and extend to the nearest outlet or junction box. Install a green grounding conductor inside all non-metallic conduits or raceways.

M. Conduit Material
   1. All wiring to be E.M.T. type conduits unless in plenum or above the 8’ level in mechanical rooms and attics.
   2. All conduits to be a minimum of 1/2 ".
   3. All flexible conduits will not exceed 6’ in length and are to be used only in areas where vibrations and/or expansion joints are present.
   4. Flexible conduit to be used for connecting any element to its conduit. The length of this flexible conduit will not exceed 24".

5. Flexible steel conduit shall be used where flexible conduit connections are required and at connections to all motorized equipment and motors. If located outside seal-tight shall be used.
6. In damp areas, the conduit and related equipment must be suitable for the application.
7. Electrometalic tubing shall be installed for all exposed work and for all concealed work in applications where conduit is required.
8. Conduit shall be by Allied, Triangle, Republic, Youngstown, Canon, Rob Roy, or approved equal.
9. For exposed finished area where the conduit cannot be run in ceiling spaces, wall cavities or attics, surface-mounted powdered coated conduit is acceptable. Provide samples for size and color selection. Wiremold may be used only with Owner's approval.

N. Conduit Installation
1. All wiring in mechanical rooms at heights below 8 feet must be run in conduit. Otherwise, wiring in all other open areas (areas with no ceiling or cloud ceiling) must be routed in conduit. Wiring above accessible ceilings or drops in walls to single control devices need not be in conduit.
2. All conduits to be installed in a concealed manner where possible and shall be installed parallel to the lines of the building.
3. All exposed conduits in finished areas shall be white powder coated and installed parallel or at right angles to be the building walls or floors. Wiremold is to be used only as directed by Owner.
4. Conduit bends shall be made with standard hickeys of proper size. Radius of bends to be at least 6 times the diameter of the conduit. Runs between outlets shall not contain more than the equivalent of three-quarter bends. Conduit runs shall be continuous from outlet to outlet, outlet to cabinet, etc.
5. Conduits shall be installed with pitch toward outlet box wherever possible. All heavy wall conduits shall have two locknuts and a bushing at each termination outlet box, junction box, etc., except where terminated in a threaded hub.
6. A bushing shall be used where conduit enters a panel box. Bushing for No. 4 AWG or larger shall be insulated type with provisions for grounding as type "BL" made by O-Z Electric Company or approved equal.
7. Expansion fittings shall be provided at all conduits across the building expansion joints. Fittings shall be Type "AX" or "TX" as made by O-Z Electric Company or approved equal. Provide copper bonding jumper at each expansion fitting.
8. All l" conduit to be supported every 6', the supports will be located at the connector end of the conduit.
9. Exposed conduit shall be securely fastened in place on maximum 5 ft. intervals for 3/4 " through 2 1/2 " nominal sizes. Supports may be one-hole malleable straps or other approved devices. No perforated metal straps will be permitted.
10. In mechanical attics, conduit to be run vertically up to the 8' level and run in plenum rated cable after that.

O. Wireway
1. Furnish and install at all control panel locations a NEMA 1 lay-in wireway system to bring cable into and out of the panel as detailed on the drawings and specified in this section. Furnish 3-way wireways at each panel location; one for Class 1 wiring, 1 for Class 2, and Class 3 wiring. Panels at units to be NEMA 3R or better.
2. Wireway systems at locations where cables are to be run without conduit or in a cable tray shall consist of a connection to the control panel with a vertical extension to 8'-0" or the pipe rack or cable tray level, whichever is higher. The vertical section shall terminate in a 90° fitting with a closure plate. The closure plate shall be provided with a conduit nipple with locknuts and bushings as a wire entry point into the square duct. The conduit nipple shall be one size smaller than the wireway it is associated with.

3. Wireway systems at locations where cables are to be run in conduit shall consist of a horizontal section of wireway with a length equal to the control panel width and located above the control panel and connected to the control panel with three conduit nipples, locknuts, and bushings; ne for tubing, one for Class 1 wiring and one for Class 2 and 3 wiring. Conduits for cable runs shall terminate on the wireway.
4. The intent of the wireway configurations outlined above is to provide a method for adding input and output wiring to the control panel without having to drill directly into the electronics enclosure after the system is on line and running and to provide sufficient area to land field conduits while maintaining appropriate circuit segregation for wire entry into the controller enclosure. The installation of wireway shall be made with this consideration in mind.

P. Hangers and Anchors
1. Where control system tubing is run on trapezes and/or hangers used by and or installed by other trades, supports for trapezes shall be coordinated by all trades using the trapeze to assure that the anchor system is not overloaded and is sufficient for the load imposed including a margin of safety and seismic considerations. Under no circumstances shall a trapeze or hanger system installed by the electrical trades be used to support work by any other trade, nor shall the electrical trades use the trapezes installed by any of the other trades for the support of electrical equipment, all as required by the National Electric Code. Similarly, under no circumstances shall a trapeze or hanger system installed by the sprinkler trades be used to support work by any other trade, nor shall the sprinkler trades use the trapezes installed by any of the other trades for the support of sprinkler systems or equipment, all as required by NFPA 13, standard for The Installation of sprinkler Systems.
2. Anchors to be loaded in tension for use in existing concrete structure and anchors loaded in tension and not cast in place shall be epoxy resin set anchors installed per the manufacturer's recommendations for technique, size, loading, embedment, etc. Where anchors are loaded in shear at these locations, suitably sized and installed wedge type anchors may be used.
3. In all cases anchor loading shall be based on hanger spacing, weight of the pipe to be supported when full and insulated, weight of any additional loads imposed upon the anchor, wind loading, seismic loading, quality of the material that the anchor is being installed in, etc. The control contractor shall verify in the field that the anchors used and the materials that they are being installed in are suitable for the load imposed and shall bring any problems to the attention of the Engineer in writing immediately and not proceed without direction from the Engineer.
4. Wedge type anchors shall be Hilti Kwik Bolt II. Adhesive anchors shall be Hilti HVA.

3.06 FIELD SERVICES

A. Prepare and start logic control system under provisions of this section.

B. Start-up and functional test of control systems. Allow enough time for start-up and functional test prior to placing control systems in permanent operation.

C. Provide the capability for off-site monitoring at Control Contractor's local or main office. At a minimum, off site facility shall be capable of system diagnostics and software download.

D. Provide Owner's representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.07 TRAINING

A. Provide application Engineer to instruct Owner in operation of systems and equipment.

B. Provide system operator's training to include, but not limited to, such items as the following:

1. Modification of data displays
2. Alarm and status descriptors
3. Requesting data
4. Execution of commands
5. Request of logs

C. Provide on-site training above as required for up to 12 hours in 2 to 4 hour sessions (travel hours are included as part of the 12 hours) as part of this contract.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. This section describes the sequence of operations for HVAC control systems specified elsewhere in these specifications.

B. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

PART 2 PRODUCTS

THE EXISTING JOHNSON METASYS SYSTEM SHALL BE EXTENDED.

PART 3 EXECUTION

3.01 SEQUENCE OF OPERATIONS

A. Provide a complete and operational temperature control and building automation system based on the following points and sequence of operation, complete as to sequences and standard control practices. The determined point list is the minimum amount of points that are to be provided. Provide any additional points required to meet the sequence of operation.

B. Object List:
   1. The following points as defined for each piece of equipment are designated as follows:
      a. Binary Out (BO) - Defined as any two-state output (start/stop) (enable/disable), etc.
      b. Binary In (BI) - Defined as any two-state input (alarm, status), etc.
      c. Analog In (AI) - Defined as any variable input (temperature) (position), etc.
      d. Analog Out (AO) - Defined as any electrical variable output. 0–20mA, 4–20mA and 0–10VDC are the only acceptable analog outputs. The driver for analog outputs must come from both hardware and software resident in the controllers. Transducers will not be acceptable under any circumstance.

C. Occupancy and Performance Time Periods: Units operate continuously.

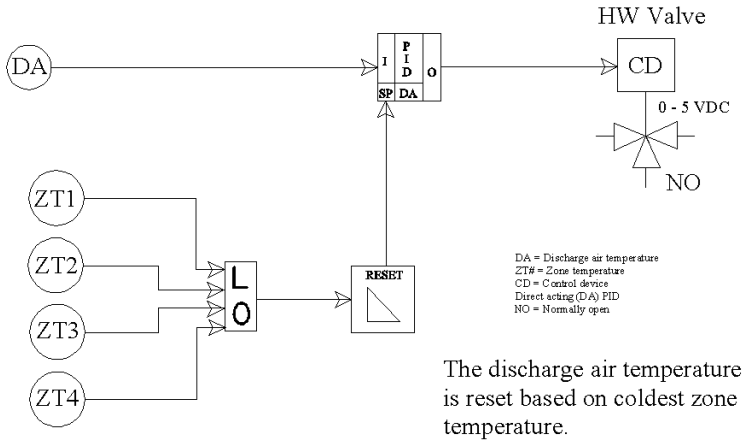
PART 4 SEQUENCE OF OPERATION

4.01 LEVEL OF DETAIL

A. Major changes in provided sequence of operation must be approved of in writing by the Owner and the Engineer.

B. The Control Contractor shall provide two types of documentation for each system (e.g., boiler plant, RTU's, etc.). The two types of documentation include:
   1. Control Logic
      a. Control logic shall be a series of statements providing, for each system, the following items:
         1) Identification of control process.
         2) Narrative of control loop or logic algorithm.
         3) Control parameters such as setpoints and differentials (e.g., throttling range, gains) reset schedules, and adjustable parameters for all points.
         4) Identification of all constraints, limits, or interlocks that apply to control loop.
         5) Identification of all DO, DI, AO, AI points that apply to system.
         6) Identification of all communication needs (data points from outside control unit).
   2. Logic Diagrams
      a. For each control logic system, a logic diagram shall show the actual interaction of the points (real and virtual) and the logic algorithm.
      b. The diagram should identify
         1) System being controlled (attach abbreviated control logic text).
         2) All DO, DI, AO, AI points.

3) Virtual points.
4) All functions (logic, math, and control) within control loop.
5) Legend for graphical icons or symbols.



4.02 STANDARDIZATION

A. All control loops will be standardized throughout the programming code.

4.03 PROGRAMMING GUIDELINES

A. All adjustable setpoints shall be developed as software points stored at memory locations so that setpoints can be changed by recommending the data stored at the memory location rather than by entering the program and changing parameters and lines in program code.

B. Where reset schedules are specified or required the schedules shall be set up so that the operator enters the following points into memory locations.
   1. Two points for the independent variable on the reset schedule.
   2. Two points for the dependent variable on the reset schedule.

   The computer system shall then use these values as input parameters to the appropriate program or programs and calculate the reset schedule based on these values.

C. Where several analog outputs are to be controlled in sequence by one control loop, software shall be arranged so that the sequence is guaranteed regardless of the spring range of the actuators and to prevent simultaneous heating and cooling.

D. Programs controlling several pieces of equipment as one system shall reside in one control unit. Where programs use data points that reside in other control units the programs shall employ logic (either in software, firmware, hardware, or a combination of all three) to detect loss of communications with the remote control units containing the required data. When such a failure is detected, the program logic shall revert to a safe operating mode that will allow the controlled systems to remain in operation until normal system communication resumes. A pilot light on the control unit shall be illuminated when such a failure mode exists. In addition, an alarm shall be sent to the HOST computers (alarm level 4). The software shall track this type of alarm and report if communication failure is higher than expected (this condition shall generate an alarm level 3, with descriptive text, at the HOST computer). All safe operating modes shall be approved by the Engineer prior to implementation.

E. Control sequences that use outdoor air conditions to trigger certain specific operating modes shall use data generated by one outdoor air temperature sensor and one outdoor humidity sensor. In other words, the data from one pair of sensors shall be shared by the entire system.

F. All safety circuits shall be hard wired circuits using standard snap acting electric or pneumatic switches as required by the function, and shall be totally independent of the DDC system controllers. This includes interlocks that return dampers and valves to some normal, fail-safe position when the system they are associated with shuts down. It is the intent of this paragraph that the systems have the capability to be operated manually complete with safeties and fail safe interlocks even if the DDC system is off line.

G. Provide hours of operation accumulation and lead/lag sequencing of equipment based on hours of operation for all equipment with proof of operation inputs.

H. Global point name changing:
   1. The system shall provide an easy means to allow the operator to change a point name such that the point will automatically be referenced everywhere in the system by the new name.
   2. If a point name is removed from the database, any program code where the name appears must show an appropriate error signal for undefined point when the program is viewed, edited, or printed.

I. Synchronization of real-time clocks between all control panels shall be provided.

4.04 GENERAL SEQUENCE OF OPERATION GUIDELINES

A. Control of all central fan systems, boilers, DX units, heaters, and pumping stations shall be based on run requests, heating requests or cooling requests from zone controls.

B. Reset of supply air temperature and hot water temperature shall be based on zone temperature conditions via the zone's percentage of heating or cooling load.

C. Unless otherwise indicated, all control loops will use PID loops. The coefficient for the derivative component is zero (0) unless otherwise indicated.

D. All HVAC system controls shall be designed such that simultaneous heating and cooling, reheating, and recooling are minimized. This applies as well to non-mechanical treatment of mixed air (e.g. outside air, heat recovery, etc.) which must then be mechanically reheated or recooled.

E. Alarms: Except as directed otherwise by the Owner, all alarms will be registered at the building operator's terminal as well as at the Maintenance Building remote operator's station. Alarms are to be registered with a message explaining the nature of the alarm and which building/location the alarm is in.

F. Whenever a setpoint is referred to as "adjustable" in these standards, the setpoint is to be easily and directly adjustable at the operator's terminal and Maintenance Building remote operator's station, and is not to require any code modification. This may require assigning virtual points to all adjustable setpoints. Frequently adjusted points, including space temperature setpoints, shall be adjustable from the graphics screen (e.g., floor plan screen).

G. There are many interlocks and limits within each control loop or algorithm that may not be obvious or stated in this specification. The Control Contractor is responsible for identifying and programming these interlocks and limits into the software. The CO_2 Demand Ventilation Control algorithm is a good example of the complexity of the control loop with interlocks and limits.

H. The Control Contractor will replace any and all equipment (actuators, chillers, etc) that fail due to programming errors. Such errors include, but are not limited to: moving actuators a couple fractions of a degree every second or so in response to some infinitesimal change in a measured variable or repeatedly turning equipment on/off within a short time period. The Control Contractor will avoid these problems by incorporating time delays, dead bands, and other programming techniques into the sequence of operation.

I. Programmable time-of-day (start/stop) control shall be implemented for all HVAC equipment, except for:
   1. Equipment that is interlocked with other equipment under direct start/stop control (e.g. exhaust fans interlocked with an air handling unit).
   2. Equipment that must run continuously for reasons of safety.
   3. As otherwise noted in these standards.

J. Auto-tuning algorithms will not be used to initially tune control loops.

4.05 SEQUENCE OF OPERATION GUIDELINES

A. This specification is intended to refine or elaborate on the sequence of operations provided by the Engineer. Note: there are many issues that may make any of these standard sequences inapplicable to a specific situation: thus, the Control Contractor should obtain written approval by the Engineer to implement the sequence of operations contained in this specification.

B. The Control Contractor shall adhere to all applicable specifications, unless they submit written exceptions to the Owner and Engineer and such exceptions are approved in writing. Written exceptions shall state the specification's sequence of operations, the Control Contractor's proposed sequence of operations, and the reasons why the proposed sequence specifications are preferable to the sequences in this specification or those provided by the Engineer.

C. It is the Control Contractor's responsibility to improve upon these specified sequences of operations if necessary. All improvements will be provided in writing to the Engineer for his/her written approval.

D. The Control Contractor is responsible for accurately controlling and communicating with all packaged fan units or air handling units.

4.06 SEQUENCE OF OPERATION – TERMINAL UNIT CONTROL

A. Space Temperature Setpoints:
   1. Default Setpoints:
      a. Occupied Heating Setpoint: Corridor: 70 °F
      b. Occupied Cooling Setpoint: Corridor: 72 °F
   2. Space Setpoint Adjustment:
      a. Adjustment (General): Setpoint adjustments may be accomplished either at the operator workstation or locally at the thermostat.
      b. Adjustment Range: Setpoint adjustments are limited to (+/-) 2°F (adjustable). Space temperature dead band (4 °F, adjustable) is maintained during setpoint adjustments.
      c. See required design temperature range on the construction documents.
   3. Damper Operation:
      a. Maintain constant airflow at all times to meet the Code required Air Changes.
   4. Heating Valve Operation:
      a. Occupied Mode: Valve will modulate based on heating demand to maintain occupied heating setpoint.

Valve Position - Optimal Start	
Space Temperature > Occupied Heating Set Point	**Valve Position**
No	100% (Subject to discharge air temperature limiting)
Yes	0%

B. Discharge Air Temperature Limiting (All Modes):
   1. Discharge temperature maximum is 110º F.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. The requirements of this section apply to the HVAC heating and cooling water systems. Provide pipe, pipe fittings, pumps, and related items required for complete piping system.

B. Related Work: The requirements of Section 23 0500, Common HVAC Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. General: ASTM and ANSI Standards are indicated. In addition, special standards are referenced where neither ASTM nor ANSI Standards are applicable.

1.03 STORAGE AND HANDLING

A. Provide factory-applied end caps on each length of pipe and tube. Maintain end caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.04 SUBMITTALS

A. Submit catalog data, construction details, and performance characteristics for all equipment.

B. Submit operating and maintenance data.

PART 2 PRODUCTS

2.01 PIPING MATERIALS

A. Black Steel Pipe:
   1. Applications:
      a. Heating water supply and return
   2. Pipe: Schedule 40, standard black steel pipe ASTM A-106 or A-53.
   3. Threaded Fittings: For above ground installations only.
      a. Banded class 120 cast iron fittings, ANSI B16.4 to 125 psi.
   4. Welding Fittings: Beveled ends, seamless fittings of the same type and class of piping above.
   5. Flanged Fittings: For above ground installations only.
      a. Class 125 cast iron fittings, ANSI B16.2 including bolting to 125 psi.
      b. Facing and Gasketing: Selected for service pressures and temperatures. Full-faced for cast iron and raised face for steel flanges.

B. Copper Pipe and Tube:
   1. Application:
      a. Heating water
   2. Pipe: Type L hard temper copper with soldered joints, ASTM B88.
   3. Fittings: Wrought copper solder-joint fittings, ANSI B16.22.

2.02 MISCELLANEOUS PIPING MATERIALS/PRODUCTS

A. Welding Materials: Provide welding materials as determined by the installer to comply with installation requirements.

B. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges; raised-face for steel flanges. Pressure and temperature rating required for the service indicated.

C. Flexible Pipe Connectors: 300 series stainless steel corrugagted hose in dog leg arrangement to allow 3 dimensional movement of 2". Flanged, weld or threaded connection per application and at Contractors choice. Grooved ends not allowed. Working pressure and temperature of 150 PSI at 280 deg. F. Metraflex Dog Leg Series or approved.

D. Insulating (Dielectric) Fittings: Provide standard products recommended by the manufacturer for use in the service indicated, and which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and reduce corrosion. Victaulic "Clear Flow."

E. Soldering and Brazing Materials: Provide soldering materials as determined by the installer to comply with installation requirements.
   1. Tin-Antimony Solder: ASTM B32, Grade 95TA.
   2. Lead-Free Solder: ASTM B32, Grade HB. Harris "Bridgit" approved.
   3. Silver Solder: ASTM B32, Grade 96.5TS.
   4. Brazing Material: ASME SFA-5.8

F. Gaskets for Flanged Joints: ANSI B16.21; full-faced for cast-iron flanges; raised-face for steel flanges. Pressure and temperature rating required for the service indicated.

G. Sleeve Seal: Rubber-link pipe wall and casing closure. Thunderline Link-Seal. For fire rated wall, floor or ceiling penetrations, 3-M "CP-25" caulk, "No. 303" putty and/or "PSS 7904" sealing system.

H. Strainers: "Y-pattern," 300-psig ductile iron body, or Class 125 [cast iron body] [bronze body] with tapped blow-off connection and removable [20 mesh] [1/16" perforations] [1/8" perforations] stainless steel screen. Victaulic Style 732 / W732, NIBCO, or Engineer approved equal.

I. Sleeve Seal: Rubber-link pipe wall and casing closure. Thunderline Link-Seal. For fire rated wall, floor or ceiling penetrations, 3-M "CP-25" caulk, "No. 303" putty and/or "PSS 7904" sealing system.

PART 3 EXECUTION

3.01 PIPE INSTALLATION

A. General: Install pipe, tube and fittings in accordance with recognized industry practices. Install each run accurately aligned with a minimum of joints and couplings, but with adequate and accessible unions and flanges for disassembly, maintenance and/or replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings.

B. Piping Runs: Route piping close to and parallel with walls, overhead construction, columns and other structural and permanent-enclosure elements of the building (pitched for drainage). If not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building or equipment and avoid diagonal runs. Wherever possible in finished and occupied spaces, conceal piping from view. Do not encase horizontal runs in solid partitions.

C. Piping: Install for services as specified in Part 2. The following are Contractor's options.
   1. Heating Water Piping: Standard black schedule 40 steel pipe and 125 pound black cast screwed or approved welding fittings for pressures up to 75 psi. Welded connections on all piping underground, piping in tunnel or tile or otherwise inaccessible and on all equipment room headers 4" and over. Weldolets, Threadolets, or schedule 80 shaped nipples may be used for take-offs up to half the nominal size of main.

3.02 PIPING JOINTS

A. General: Provide joints of the type indicated in each piping system, and where piping and joint as manufactured form a system, utilize only that manufacturer's material.

B. Ferrous Threaded Piping: Thread pipe in accordance with ANSI 82.l; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave no more than 3 threads exposed.

C. Solder Copper Tube and Fitting Joints: In accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in a manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens. "T-Drill" field formed tees may be utilized where the main is at least two pipe sizes larger than the branch.

D. Braze Copper Tube and Fitting Joints: Where indicated, in accordance with ANSI/ASME B31.5. Pass a slow stream of dry nitrogen gas through the tubing at all times while brazing to eliminate formation of copper oxide.

E. Weld Pipe Joints: In accordance with recognized industry practice and as follows:
   1. Weld pipe joints only when ambient temperature is above 0 degrees F.
   2. Bevel pipe ends at a 37.5 degree angle, smooth rough cuts, and clean to remove slag, metal particles and dirt.
   3. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10"; 8 welds for pipe sizes up to 20".
   4. Build up welds with a stringer-bead pass, followed by a hot pass, followed by a cover of filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusion.
   5. Do not weld out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.
   6. Install forged branch-connection fittings wherever branch pipe is indicated, or install regular “T” fitting at Contractor's option.

F. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gasket.

G. Changes in Direction: Use fittings for all changes in direction. Run lines parallel with building surfaces.

H. Insulating (Dielectric) Fittings: Comply with manufacturer's instructions for installing unions or fittings. Install in a manner which will prevent galvanic action and stop corrosion where the "joining of ferrous and non-ferrous piping" is indicated.

I. Unions and flanges for servicing and disconnect are not required in installations with grooved mechanical joint couplings. (The couplings shall serve as disconnect points.)

J. Flex Connectors: Install such that there are not high or low points, place Metraflex dog leg in piping which it is installed per manufacturer’s installation manual.

3.03 MISCELLANEOUS PIPING EQUIPMENT

A. Floor, Wall and Ceiling Plates: Chrome plated pressed steel or brass screw locked split plates on all pipe penetrations in finished spaces.

B. Strainers: Install in a manner to permit access for cleaning and screen removal and with blow-off valve.

C. Sleeves: At all penetrations of concrete or masonry construction. PVC, 24 gauge galvanized steel or Schedule 40 galvanized steel pipe. Use steel pipe sleeves through beams, footings, girders or columns and for all penetrations of walls or floors below grade. Where floor finish is ceramic tile, terrazzo, or similar material extend standard steel pipe sleeves 1-1/2" above finished floor. Fabricate sleeves 1" diameter larger than pipe or insulation. PVC and sheet metal sleeves at non-structural penetrations only.

D. Sleeve Caulking: Grout uninsulated pipe with cement mortar or approved waterproof mastic. All caulking or grouting shall extend full depth of sleeve. Install UL sealing caulk, putty and/or system at all penetrations of fire rated walls, floors and ceiling.

E. Valves: Install valves in accordance with Section 23 05 00. Install control valves specified in other Division 23 sections.

3.04 CLEANING

A. General: Clean all dirt and construction dust and debris from all mechanical piping systems and equipment and leave in a new condition. Touch up paint where necessary. Clean interior of pipe where local cutting and joining has taken place.

B. Heating Water Piping Systems:
1. Add cleaning chemical in proper concentration to clean system of manufacturing and installation contamination and residue.
2. Fill, vent and circulate the system with this solution at design operating temperature. After circulating for four hours, bleed out cleaning solution by the addition of fresh water to the system.
3. Test for pH and add sufficient amount of the cleaning chemical to obtain a pH between 7 and 8.
4. Clean all strainers and remove start-up strainers (from suction diffusers) after the system has operated for one week.

3.05 TEST

A. General:
1. Minimum duration of two hours or longer, as directed for all tests. Furnish report of test observation signed by qualified inspector. Make all tests before applying insulation, backfilling, or otherwise concealing piping or connecting fixtures or equipment. Where part of the system must be tested to avoid concealment before the entire system is complete, test that portion separately, same as for entire system.
2. Place system into operation and observe any steam, condensate or water leaks for a period of at least 4 hours.
3. Observe each test section for leakage at end of test period. Test fails if leakage is observed.

B. Repair:
1. Repair piping system sections which fail the required piping test by disassembly and re-installation, using new materials to the extent required to overcome leakage. Do not use chemical stop-leak compounds, solder, mastics, or other temporary repair methods.
2. Drain test water from piping systems after testing and repair work has been completed.

C. Heating, Solar, Chilled and Condensing Water Piping: 75 psig hydrostatic for 30 psig systems without loss for four hours.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Provide Air Distribution Materials as specified herein and as shown on the Drawings.

B. Material characteristics and size shall be as indicated on the Drawings.

C. Related Work: The requirements of Section 23 05 00, Common HVAC Materials and Methods, also apply to this section.

1.02 QUALITY ASSURANCE

A. Air Distribution Equipment Rating: In accordance with AMCA certified rating procedures and bearing the AMCA label.

1.03 SUBMITTALS

A. Submit catalog data, construction details and performance characteristics for all manufactured materials.

B. For adhesives and sealants used on the interior of the building (inside the waterproofing system), include printed statement of volatile organic compound (VOC) content.

PART 2 PRODUCTS

2.01 SHEET METAL

A. Quality Assurance: Galvanized steel sheet metal except where otherwise indicated. Metal gauges, joints and reinforcement in accordance with Mechanical Code, ASHRAE and SMACNA standards. Ductwork shall be fabricated to the following pressure classifications unless noted otherwise:
   1. Return and exhaust ducts: 1" negative.
   2. Supply ducts from fan discharge to VAV box inlet: 4" positive. VAV box discharge to diffuser: 2" positive.

B. Acoustical Duct Lining: Line ducts with 1" thick lining (unless noted otherwise) for installation inside the building insulation envelope, and 2" (R-8) for installation outside the building insulation envelope. Schuller “Linacoustic,” Owens Corning “Aeroflex” Type 150, and Certainteed “ToughGard” Type 150 approved, meeting NFPA 90A and B requirements for maximum flame spread and smoke developed. Duct liner adhesive shall conform to ASTM C916.Mechanically attach lining to sheet metal duct with fasteners conforming to SMACNA Standard MF-1-1971, Schuller Grip Nails or Gramweld welding pins. Apply fire-retardant type adhesive similar to Schuller No. 44 adhesive, Benjamin Foster 81-99, Insul-Coustic 22 or 3M equivalent on all leading edges, joints and seams.

C. Duct Sealing Tapes: Provide one of the following UL listed ductwork sealing tape systems.
   1. Two-part sealing system with woven fiber, mineral gypsum impregnated tape and non-flammable adhesive. Hardcast “DT” tape and “FTA-20” adhesive, United “Uni-Cast” system, or accepted substitute.
   2. For joints and seams exposed to the weather in lieu of soldering, United “Uni-Cast” system or approved.
   3. Sealing systems with VOC content are not allowed.
   4. Sealants and Primers – General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No. 1168.

D. Optional Duct Joints for Sheet Metal Ducts: “Ductmate System” by Ductmate Industries, Inc., Ward Duct Connectors, Inc., Mez Industries, or acceptable substitute. Spiramir self-sealing round duct connector system meeting Class 3 leakage standards with EPDM o-ring seal.

E. Flexible Connections: Flexible duct connectors shall be used to accommodate differential motion across building seismic joints. The flexible duct connect is an air-tight and water proof flexible connection (2”).
   1. Indoor Flexible Connector Fabrics:
      a. Fire Retardant Neoprene coated Fiberglass resistant to chemicals, gasoline and grease:
         1) Meets NFPA 701
         2) Minimum Weight: 32 oz/sq.yd.
         3) Tensile Strength: 500 lbs in the warp and 500 lbs in the filling
         4) Service Temperature: -40 to 200 deg F
      b. Fire Retardant Neoprene coated Fiberglass for high pressure applications and large ducts:
         1) Meets NFPA 701
         2) Minimum Weight: 40 oz/sq.yd.’
         3) Tensile Strength: 630 lbs in the warp and 465 lbs in the filling
         4) Service Temperature: 285 deg F

2.02 GRILLES, REGISTERS AND DIFFUSERS

A. Description: Provide grilles, registers and diffusers as shown on the Drawings.

B. Finishes:
   1. Steel: Flat white enamel prime coat, factory applied on ceiling diffusers. Others are to have a baked enamel finish, color as selected by Architect.
   2. Aluminum: Anodized clear finish unless indicated otherwise.

C. Manufacturers: Carnes, Krueger, Titus, Price, and Tuttle & Bailey are accepted substitutes where only Titus model numbers are listed. Where other manufacturer's products are listed and/or "accepted substitute" is indicated, only the products or an accepted substitute for that item shall be provided.

D. Sidewall or Ceiling Return or Exhaust Register: Face bars parallel to long dimension on ceiling type and horizontal on wall type; bars set at 35 degrees to 45 degrees, spaced on 0.66" to 0.75" centers; key operated opposed blade volume damper. Titus 350RL Series.

E. Ceiling Matched Return and/or Exhaust Register: To match adjacent ceiling outlets. Use in spaces containing ceiling diffusers and/or T-bar ceilings. Provide with damper except where dampered plenums are indicated. Match manufacturer of supply.

F. Perforated Face Diffusers: Perforated face high capacity, snap-in or concealed hinged face plate with modular core directional diffusers and margin to suit the ceiling construction. Provide with opposed blade volume damper. Panel size shall be 24" x 24" where lift-out tile ceiling system is indicated. Titus PMC.

2.03 AIR TERMINALS

A. Variable Air Volume Terminal Box: Construct unit casings of 22 [20] gauge galvanized steel fully lined with 1/2", 2 lb. density, neoprene coated fiberglass complying with the UL Standard 181 for erosion, and NFPA 90A for fire resistivity. Cover liner with Mylar film.
   1. Unit Inlets: Double galvanized round, obround, or rectangular blade sandwiching the damper gasket. Damper shaft shall be a single 0.5” full length solid steel shaft spanning across the entire damper blade from side to side in self-lubricating bearings.
   2. Attenuation Section: Integral to the basic unit.

3. ARI Certified: Test in accordance with ARI Standard 885-98 appendix E.
4. Unit Sound Power Levels (second through seventh octave band): At minimum pressure drop, ratings shall not exceed 32 NC ducted or radiated.
5. Pressure Independent VAV Terminals: Equip with velocity controls to control cfm independent of duct static pressure.
6. Factory Furnished Accessories: All actuators, controls, and circuitry contained in a sheet metal enclosure.
7. Control Sequences: Operational sequences shall be as shown on the Drawings.
8. Reheat Coil: Provide heating water reheat coils of capacities indicated.
9. Manufacturers: Price, Titus, Tuttle & Bailey, or approved substitute.

PART 3 EXECUTION

3.01 DUCTWORK INSTALLATION

A. Support: Install ductwork with 1" wide strap cradle hangers not more than 8' on centers or as required by code. Support terminal units independent of adjacent ductwork. Attach to available building construction according to good practices for materials involved. Manufactured hanger system acceptable in lieu of fabricated hangers at Contractor's option. Ductmate "Clutcher" system or approved. Support flexduct where shown to be used for lengths beyond 4' per above requirements. Comply with SMACNA Duct Construction Standard Figure 3-9 and 3-10. Where cable support system is selected by the Contractor attachment with eye-lag for wood is allowed if:
   1. The point of connection is more than 6" from open web joist panel points.
   2. The Lag is 1/4" or smaller and sized for the working load required.
   3. Is centered in the structured member and install perpendicular to the penetrated surface.

B. Elbows and Fittings: Construct elbows with throat radius equal to duct width in plane of turn or make them square and provide double wall, air foil turning vanes.

C. Fittings: Make transitions and take-offs as shown on Drawings. Provide volume dampers and splitter dampers as indicated on Drawings and as specified. Saddle tees are not allowed.

D. Acoustical Duct Lining:
   1. Acoustically line all fan unit intake and discharge plenums, all ductwork indicated as lined on the Drawings, all sheet metal ductwork specified per Section 23 0700 as insulated, where exposed to view or subject to damage in areas such as mechanical rooms, and, at the Contractor's option, all insulated ductwork specified in Section 23 0700 except outside air intake ducts. The duct size noted on the Drawings is the clear opening of the duct with insulation. Insulation shall not reduce duct size listed.
   2. All duct designated to receive duct liner shall be completely covered with a fire-resistant, fiber-bonding coating, or covering (composite, polymer, vinyl or neoprene) that reduces airflow resistance and controls fiber release. The duct lining shall be adhered to the sheet metal with 100% coverage of a fire retardant adhesive. The coated surface of the duct liner shall face the airstream. When width of duct exceeds 12" and also when height exceeds 24", use corrosion resistant mechanical fasteners 12" on center maximum lateral spacing and 18" on center maximum longitudinal spacing. Start fastening within 3" of upstream transverse edge of the liner and within 3" of the longitudinal joint. Mechanical fasteners shall be either impact-driven or weld-secured and shall not pierce the duct walls. Fasteners and washers of the specified type and length shall be used assuring no greater than 10% compression of the liner thickness. Installation shall be made so that no fastener pins protrude into the airstream. No gaps or loose edges shall occur in the insulation. Top pieces shall be supported by the side pieces. Provide insulated build out frames for attaching dampers at running vanes where required.
   3. All transverse and longitudinal abutting edges of duct lining shall be sealed and lapped 3" with a heavy coat of approved adhesive, in accordance with the manufacturer's recommendations. All upstream transverse edges shall be installed with sheet metal nosings. All raw exposed edges of lining shall be 'buttered' with approved adhesive.

4. Lining is not allowed for Outside Air Ducts.

E. Duct Insulation: Specified in Section 23 07 00.

F. Sealing: Caulk, seal, grout and/or tape ductwork and plenums to make airtight at seams, joints, edges, corners and at penetrations. Solder all seams, joints, etc., on all ductwork exposed to the weather. Install specified tape in accordance with manufacturer's requirements using degreaser on surfaces to be taped and wiped to eliminate moisture.

G. Flexible Duct Connections:
1. Install in full extended condition, free of sags and kinks. Install enough flex duct length to allow for movement of 2”.
2. Make all joints and connections with 1/2" wide positive locking steel straps or nylon self-locking straps and make connections to non-metallic ducts with sheet metal sleeves or manufactured sheet metal "spin-in" fittings.
3. On vertically suspended ducts, secure with a minimum of three sheet metal screws on a maximum of 8" on center.

3.02 NEW DUCTWORK CLEANING

A. Store all ductwork materials on pallets or above grade, protected from weather, dirt/mud and other construction dust.

B. Remove all accumulated dust, dirt, etc. from each duct section as it is being installed.

C. Cover all ductwork terminations during construction to prevent accumulation of dust and debris.

END OF SECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. Do all work in accordance with regulations of National Electrical Code, National Electrical Safety Code, National Fire Codes, and other applicable codes.

B. Whenever the requirements of the Electrical Specifications or Drawings exceed those of the applicable code or standard, the requirements of the Specifications and Drawings shall govern.

C. This Contractor is bound by the General Conditions, Supplementary Conditions, Special Conditions, and Division 1 bound herewith in addition to this Specification and accompanying Drawings.

D. Bidders shall view the site and shall include all costs incurred by existing conditions in the bid proposal.

1.02 QUALITY ASSURANCE

A. All materials shall be new, of manufacturer's latest design and of the best quality. The materials shall be manufactured in accordance with applicable standards of NEMA, ANSI, or UL and shall be UL listed.

B. Complete each system as shown and place in operation except where only rough-in or partial systems are called for. Each system shall be tested and left in proper operation free of faults, shorts, or unintentional grounds.

C. Protect electrical work, wire and cable, materials and equipment installed under this Division against damage by other trades, weather conditions, or any other causes. Equipment found damaged or in other than new condition will be rejected as defective.

PART 2 PRODUCTS

2.01 MATERIALS AND METHODS

A. Non-metallic plastic conduit (PVC) shall be used for power systems underground feeders, including runs under the building slab. Minimum 3/4” trade size. PVC shall not be used inside buildings.

B. With the exception of secondary service conduits, all conduits shall be routed overhead.

C. Galvanized Rigid Conduit (GRC) and/or Intermediate Metal Conduit (IMC) shall be used for all branch circuiting.

D. GRC and IMC shall be coupled and terminated with threaded fittings. Ends shall be bushed with insulating bushings equal to T&B 1220 or 1230 series.

E. The Contractor shall provide supplemental ground bus in terminating switch and panelboards, and green ground wire as per code rules, for all PVC runs.

F. Provide duct-seal at ends of all underground and under slab conduits.

G. All elbows installed in PVC conduit runs shall be long sweep galvanized rigid steel.

H. Wire shall be copper, No. 12 minimum size for lighting and power uses. Insulation to be type THHN or THWN except where adverse conditions require other insulation type.

I. Splices and Terminations: Splices shall utilize wing nut connector installed properly; splices for No. 8 and larger wires shall be made with approved pressure type connectors; all taped joints shall be applied in half-lap layers without stretching to deform.

J. Outlet boxes shall be galvanized stamped steel with screw ears, knock-out plugs, mounting holes, fixture studs if required.

K. Safety and disconnect switches shall be NEMA type HD (heavy duty), quick-make, quick-break, dual rated with electrical characteristics as required by system voltage and the load served. Approved manufacturer: Siemens, Square D, Cutler Hammer, G.E..

L. All wiring devices and plates to be specification grade. Ivory color. Receptacles: Hubbell 5362 series, Switches: Hubbell 1221 series.

M. Circuit breakers shall be fully interchangeable, without disturbing adjacent units, quick-make, quick-break, ambient compensated, and trip indicating. Provide complete, accurate, typewritten resulting circuit schedules in panel.

N. Provide grounding of the electrical system in accordance with Article 250 of the National Electrical Code. All raceway systems are to contain a grounding conductor sized in accordance with the NEC.

O. Provide all lighting outlets indicated on the Drawings with a fixture of the type designated for the location. Outlet symbols on the Drawings without a type designation shall have a fixture the same as those used in similar or like locations. Provide lamps for all fixtures.

2.02 INSTALLATION REQUIREMENTS

A. Electrical plans are diagrammatic. Verify exact equipment locations for all equipment. Coordinate with other trades and installations to avoid conflicts

B. All work shall be installed in a neat, inconspicuous, professional manner. Conduit runs shall parallel structural lines where exposed.

C. Support conduits nominally every 6 feet along runs and within 18 inches of terminations, ells and fittings. Outlet boxes, fixtures and equipment shall be securely mounted and supported.

D. The site shall be left clean and free of dirt and debris. Panels, fixtures, outlets and equipment shall be left clean and free of foreign materials and dirt.

E. Switches and all controls shall be clearly and permanently labeled.

F. Lighting fixtures of types and sizes as indicated shall be furnished and installed complete. Provide with all required mounting accessories.

G. Fixtures shall be left clean at the time of acceptance of the work with. If fixtures are deemed dirty at completion of the project, the Contractor shall clean them.

H. Fixtures shall be carefully aligned, leveled in straight lines, and located as shown on the drawings.

PART 3 EXECUTION

3.01 EQUIPMENT AND LIGHTING CONNECTIONS

A. Provide complete electrical connections for all items of equipment and lighting requiring such connections, including branch circuit wiring, materials, devices, and labor necessary for a finished working installation.

B. Verify the rough-in and wiring requirements for all equipment provided under other Divisions of the work and requiring electrical connections with equipment supplier and installer prior to rough-in. Check the voltage and phase of each item of equipment before connecting. Motor connections shall be made for the proper direction of rotation.

C. Conduit, wire and circuit breaker sizes for equipment furnished under other Divisions are based on the equipment ratings of one manufacturer. The equipment actually furnished may be of a different brand with different electrical characteristics. Conduit, wire and circuit breakers shall not be ordered or installed until exact electrical requirements are obtained. Responsibility for this coordination shall rest with the Contractor.

3.02 GUARANTEE

A. Guarantee the electrical installation against all defects in materials, equipment, and workmanship for one year after the date of acceptance of the work. Defects shall be properly remedied to the satisfaction of the Architect at no cost to the Owner.

END OF SECTION