

Project Manual

DUNN COUNTY COURTHOUSE

Manning, North Dakota



Bismarck

402 E Main Avenue Suite 1

Bismarck, ND 58501

 701.255.1617

Project Number: JLG 24146

Date: October 21, 2025

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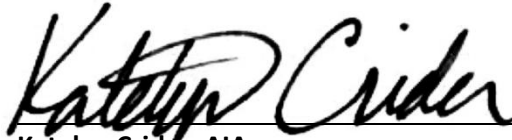
SECTION 00 0105 - CERTIFICATIONS PAGE

DUNN COUNTY COURTHOUSE

MANNING, NORTH DAKOTA

Architect

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision, and that I am a duly Registered Architect under the laws of the State of North Dakota.



Katelyn Crider, AIA
Reg. No. 2867

October 21, 2025

Structural Engineer

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

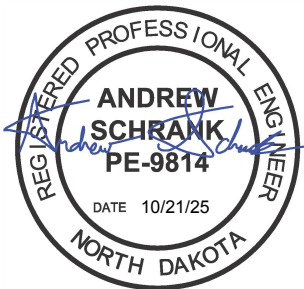


Eric A. Greiff, PE
Reg. No. PE-4983

October 21, 2025

Civil Engineer

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.



Digitally signed by Andrew
Schrank
Date: 2025.10.20 15:44:06 -06'00'

Andrew Schrank, PE
Reg. No. 9814

October 21, 2025



Mechanical Engineer

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

A handwritten signature in green ink, reading "Caleb Bulow", written over a horizontal line.

Caleb Bulow, PE
Reg. No. 7110

October 21, 2025



Electrical Engineer

I hereby certify that this Plan, Specification, or Report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

A handwritten signature in blue ink, reading "Jason L. Hunze", written over a horizontal line.

Jason L. Hunze, PE
Reg. No. PE-4879

October 21, 2025

END OF SECTION

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END OF SECTION

SECTION 00 2600 - PROCUREMENT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Requirements for submitting substitution requests for materials, products, equipment and methods of construction from those required by the Procurement Documents, during the procurement phase and prior to execution of the Owner/Contractor Agreement.

1.02 SUBSTITUTIONS (DURING THE PROCUREMENT/BIDDING PHASE)

- A. The technical specification sections may have several materials, products, equipment and methods of construction specified under the same heading. Selection of a specified materials, products, equipment and methods of construction shall be at the option of the Bidder. Where materials, products, equipment and methods of construction are specified accompanied with the phrase "Or Equal", "Approved Substitution", or similar verbiage, the Bidder may submit materials, products, equipment and methods of construction for approval in accordance with the requirements of this Document.
- B. No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect (or Construction Manager as applicable) at least seven working days prior to the date for receipt of Bids.
 - 1. Submit each request for substitution on the Architect's "Procurement Substitution Request Form" included at the end of this Section.
 - 2. Submit one material, product, equipment and methods of construction per request form, either duplicated from the Project Manual or available from the Architect's office.
 - 3. Submittals not accompanied by this form properly filled in and endorsed, will be discarded without review. NO EXCEPTIONS.
 - 4. Where specified materials, products, and equipment are accompanied by a color, pattern or finish selection, requests for substitution shall include an actual sample of the proposed color, pattern or finish for review.
 - 5. Where multiple materials, products or equipment are specified within a single specification section, specifically identify which product you wish to substitute.
- C. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or rejection of a proposed substitution shall be final.
- D. Materials, products, equipment and methods of construction approved by this substitution procedure will be issued in an Addendum.
- E. Refer to Section 01 2500 for requests for substitutions after execution of the Owner/Contractor Agreement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PROCUREMENT SUBSTITUTION REQUEST FORM

TO: JLG Architects
402 E Main Avenue, Suite 1
Bismarck, ND 58501

Phone: 701-989-7719
Contact: Naomi Echternach
NEchternach@jlgarchitects.com

PROJECT: Dunn County Courthouse, Manning, North Dakota

Section Number _____ Section Title _____

Specified Product _____

Proposed Substitution _____

All of the following questions must be answered. Incomplete forms will not be reviewed.

1. The following supporting data is attached:
☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports
2. Does the proposed substitution affect dimensions shown on Drawings, or functional clearances?
☐ YES ☐ NO
3. Does the proposed substitution change the design or details shown on the Drawings?
☐ YES ☐ NO
4. Does the proposed substitution affect other trades?
☐ YES ☐ NO
5. Does the proposed substitution affect maintenance service, or source of replacement parts, if applicable?
☐ YES ☐ NO
6. Does the proposed guarantee or warranty differ from that specified?
☐ YES ☐ NO
7. If "YES" to Items 2, 3, 4, 5 or 6 above, attach a thorough explanation on your company letterhead.
8. If there are other major differences between proposed substitution and specified product, attach a thorough explanation on your company letterhead.
9. The proposed substitution was used within the last 24 months on the following project:
Project Name _____
Location _____
Architect _____ Telephone No. _____
10. Has the proposed substitution been used on a JLG Architects project within the last 12 months?
☐ YES ☐ NO; If yes, which project? _____
11. The undersigned states that the function, appearance and quality of the substitution item are equivalent or superior to the specified item.

Submitted By: Firm _____ Signature _____
Address _____
Telephone _____ Fax _____
Date _____ E-Mail _____

For Use By Design Consultant: ☐ Accepted ☐ Accepted As Noted ☐ Not Accepted ☐ Received Too Late

Name _____ Signature _____

Date _____ Remarks _____

SECTION 00 3100 - AVAILABLE PROJECT INFORMATION

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. Geotechnical Report: Entitled Proposed Dunn County Safety Center, dated September 10, 2025 and prepared by MTS.
 - 1. Digital copy is available per request to JE Dunn.
 - 2. This report identifies properties of below grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Architect/Structural Engineer.
 - 3. This report, by its nature, cannot reveal all conditions that exist on the site. Should subsurface conditions be found to vary substantially from this report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1000 - SUMMARY

PART 1 GENERAL

1.01 DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.

1.02 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.
- B. Owner intends to occupy the Project upon Substantial Completion.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

1.03 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings.
- B. 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.
- C. Existing building spaces may not be used for storage.
- D. Utility Outages and Shutdown:
 - 1. Limit disruption of utility services to hours the building is unoccupied.
 - 2. 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.
 - 3. Prevent accidental disruption of utility services to other facilities.

1.04 PHASING PLAN

- A. Refer to JE Dunn's phasing plan for areas that need to be occupied adjacent to construction.

END OF SECTION

SECTION 01 2300 - ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of Alternates.
- B. Procedures for pricing Alternates.
- C. Documentation of changes to Contract Sum and Contract Time.

1.02 DEFINITIONS

- A. Alternate: An alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1.03 ACCEPTANCE OF ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.
- C. Work Included Under Each Alternate: Make modifications to work required by each alternate selected at no additional cost to the Owner other than as proposed on the Bid Form. Bidders shall be responsible for alternates and shall see that all changes are covered under their related sections, whether specifically called out or not. Extra costs incurred due to modifications to or deviations from the Drawings or Specifications caused directly or indirectly by each alternate shall be included in each alternate bid.

1.04 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Second Floor Scope in its entirety.
 - 1. State the amount to be ADDED to the Base Bid to provide all materials, labor & equipment required for completion of the entire Second Floor Remodel Scope, (General, Mechanical and Electrical), as indicated in the drawings and specifications.
- B. Alternate No. 2: Ballistic Rated Service Window.
 - 1. State the amount to be ADDED to the Base Bid to provide all materials, labor & equipment required for providing Ballistic Rated Service windows at Recorder and County Services, as indicated in the electrical and architectural drawings and specifications.
- C. Alternate No. 3: VAVs.
 - 1. State the amount to be DEDUCTED from the Base Bid to provide all materials, labor & equipment required for providing VAV's in lieu of duct heaters, as indicated in the mechanical and electrical drawings and specifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

- A. Section 00 2600 - Procurement Substitution Procedures: Required form for substitutions requests made before the end of bidding (during procurement).
- B. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.
- C. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.03 REFERENCE STANDARDS

- A. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

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 provide same or equivalent maintenance service and source of replacement parts, as applicable.
 - 4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 5. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 6. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- 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 included in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 - 1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

- A. Section 00 2600 - Procurement Substitution Procedures specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

- A. Submittal Form (after award of contract):
 - 1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request (After Bidding/Negotiating). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
- B. Architect will consider requests for substitutions only within 30 days after date of Agreement. Requests for substitutions after the bids have been received are done so at the risk of the Contractor. Substitutions may not be granted.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- D. Substitutions will not be considered under one or more of the following circumstances:
 - 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 - 2. Without a separate written request.
 - 3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

- A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
- B. Architect will notify Contractor in writing of decision to accept or reject request.

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.

END OF SECTION

SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General administrative requirements.
- B. Number of copies of submittals.
- C. Submittal procedures.

1.02 RELATED REQUIREMENTS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 REQUESTS FOR INFORMATION (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. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 - 2. Prepare in a format and with content acceptable to Owner.
 - 3. 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 6000 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).

3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, 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. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
 5. Identify and include improper or frivolous RFIs.
- 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.
1. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 2. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.

3.02 SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
1. Coordinate with Contractor's construction schedule and schedule of values.
 2. Format schedule to allow tracking of status of submittals throughout duration of construction.

3. 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.
4. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.03 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 7800 - Closeout Submittals.

3.04 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.

3.05 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 7800 - 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.

3.06 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. 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.

3.07 SUBMITTAL PROCEDURES

- A. General Requirements:
 - 1. Use a separate transmittal for each item.
 - 2. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 - 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. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
 - 5. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 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. Color selections will not be reviewed or approved until all related products are submitted to ensure a cohesive palette.
 - d. Products that make up a system, assembly, or that are directly related to each other often must be reviewed together. Review will not begin until all components are submitted.
 - e. Coordinate with Architect and/or Construction Manager, as applicable, where schedule dictates an expedited review of products.
 - 6. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 - 7. Provide space for Contractor and Architect review stamps.
 - 8. When revised for resubmission, identify all changes made since previous submission.
 - 9. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 - 10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
- 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. Do not use shop drawings without an appropriate final stamp indicating action taken in connection with construction.

3.08 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.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

END OF SECTION

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submittals.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Control of installation.
- E. Tolerances.
- F. Manufacturers' field services.
- G. Defect Assessment.

1.02 RELATED REQUIREMENTS

- A. Section 01 3000 - Administrative Requirements: Submittal procedures.
- B. Section 01 4533 - Code-Required Special Inspections and Procedures.
- C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 SUBMITTALS

- A. See Section 01 3000 - 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.
 - 2. Test report submittals are 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.
- 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. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 1. Submit report in duplicate within 30 days of observation to Architect for information.
 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
- G. 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.

1.04 REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

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

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
 - 1. Test samples of mixes submitted by Contractor.
 - 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 3. Perform specified sampling and testing of products in accordance with specified standards.
 - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 6. Perform additional tests and inspections required by Architect.
 - 7. Attend preconstruction meetings and progress meetings.
 - 8. Submit reports of all tests/inspections specified.
 - 9. Submit a written report in binder form with an index at the conclusion of the work required by the Testing Agency. The report shall be submitted as a permanent record to the Owner, through the Structural Engineer, of all tests, logs, comments and written reports.
- C. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- D. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide delivery of samples to testing laboratories.
 - e. 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. Each Prime Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
 6. Each Prime Contractor and each agency engaged to perform inspections, tests, and similar services shall coordinate the sequence of activities to accommodate required services with minimal delay.
 7. Each Prime Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
 8. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 9. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing: The Contractor is responsible for re-testing where results of required inspections, tests, or similar services prove unsatisfactory or do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
- F. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- G. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.
- H. The Contractor shall cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel.

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. Submit qualifications of observer to Architect 30 days in advance of required observations.
1. Observer subject to approval of Architect.
 2. Observer subject to approval of Owner.
- C. 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.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01 4533 - CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

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 DEFINITIONS

- A. Code or Building Code: ICC (IBC), International Building Code, most recent edition adopted by authority having jurisdiction, including all applicable amendments and supplements without limitation, and specifically Chapter 17 - Special Inspections and Tests.
- B. 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.
- C. Special Inspections and Tests: Inspections and testing of materials, installation, fabrication, erection, or placement of components and connections mandated by Building Code to safeguard public welfare.
 - 1. Special inspections and tests are separate from and independent of tests and inspections conducted by Owner or Contractor for purposes of quality assurance and contract administration.

1.03 REFERENCE STANDARDS

- A. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2021.
- B. IAS AC291 - Accreditation Criteria for Special Inspection Agencies AC291; 2023.
- C. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Special Inspection Agency Qualifications: Prior to start of work, 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.
 - 4. Submit documentation that Special Inspection Agency is accredited by IAS according to IAS AC291.
- C. Testing Agency Qualifications: Prior to start of work, Testing Agency is required to:
 - 1. Submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Submit certification that Testing Agency is acceptable to AHJ.

4. Submit documentation that Testing Agency is accredited by IAS according to IAS AC89.
- D. Special Inspection Reports: After each special inspection, Special Inspector is required to 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 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.
- E. Test Reports: After each test or inspection, Testing Agency is required to submit report to Architect and 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.
- F. Certificates: When required by AHJ, Special Inspector will submit certification by manufacturer, fabricator, and installation subcontractor to Architect and AHJ.
 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and AHJ.
- G. Fabricator's Inspection Reports: When required by AHJ, submit reports to Architect and AHJ.
 1. Submit report in duplicate within 30 days of observation to Architect for information.

1.05 SPECIAL INSPECTION AND TESTING 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:
 - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.
- B. Testing Agency Qualifications:
 - 1. Independent firm specializing in performing testing and inspections of the type specified in this section.

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 INSPECTIONS FOR STEEL CONSTRUCTION

- A. Structural Steel: Comply with quality assurance inspection requirements of ICC (IBC)-2018.
- B. Cold-Formed Steel Deck: Comply with quality assurance inspection requirements of SDI (QA/QC).

3.03 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

- A. Reinforcement, Including Prestressing Tendons, and Verification of Placement: Verify compliance with ACI CODE-318, Chapters 20, 25.2, 25.3, 26.6.1-26.6.3; periodic.
- B. Bolts Installed in Concrete: Where allowable loads have been increased or where strength design is used, verify compliance with approved Contract Documents and ACI CODE-318, Sections 8.1.3 and 21.2.8 prior to and during placement of concrete; continuous.
- C. Anchors Post-Installed in Hardened Concrete: Verify compliance with ACI CODE-318.
 - 1. Adhesive Anchors: Verify horizontally or upwardly-inclined orientation installations resisting sustained tension loads - Section 17.8.2.4; continuous.
 - 2. Other Mechanical and Adhesive Anchors: Verify as per Chapter 17.8.2; periodic.
- D. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI CODE-318, Chapter 19, 16.4.3, 26.4.4; periodic.
- E. Concrete Sampling Concurrent with Strength Test Sampling: Each time fresh concrete is sampled for strength tests, verify compliance with ASTM C172/C172M, ASTM C31/C31M, and ACI CODE-318, Chapter 26.5, 26.12, and record the following, continuous:
 - 1. Slump.
 - 2. Air content.

3. Temperature of concrete.
- F. Specified Curing Temperature and Techniques: Verify compliance with ACI CODE-318, Chapter 26.5.3 through 26.5.5; periodic.
- G. Materials: If the Contractor cannot provide sufficient data or documentary evidence that concrete materials comply with the quality standards of ACI CODE-318, the AHJ will require testing of materials in accordance with the appropriate standards and criteria in ACI CODE-318, Chapters 19 and 20.

3.04 SPECIAL INSPECTIONS FOR SOILS

- A. Materials and Placement: Verify each item below complies with approved construction documents and approved geotechnical report.
 1. Design bearing capacity of material below shallow foundations; periodic.
 2. Design depth of excavations and suitability of material at bottom of excavations; periodic.
 3. Materials, densities, lift thicknesses; placement and compaction of backfill: continuous.
 4. Subgrade, prior to placement of compacted fill verify proper preparation; periodic.
- B. Testing: Classify and test excavated material; periodic.

3.05 SPECIAL INSPECTION AGENCY DUTIES AND RESPONSIBILITIES

- A. Special Inspection Agency shall:
 1. Verify samples submitted by Contractor comply with the referenced standards and the approved Contract Documents.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified reference standards.
 4. Ascertain compliance of materials and products with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Attend preconstruction meetings and progress meetings.
 8. Submit reports of all tests or inspections specified.
- B. Limits on Special 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. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- D. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.06 TESTING AGENCY DUTIES AND RESPONSIBILITIES

- A. Testing Agency Duties:
 1. Test samples submitted by Contractor.
 2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 3. Perform specified sampling and testing of products in accordance with specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of work or products.
 6. Perform additional tests and inspections required by Architect.
 7. Attend preconstruction meetings and progress meetings.
 8. 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.

3.07 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.

3.08 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. Submit qualifications of observer to Architect 30 days in advance of required observations.
1. Observer subject to approval of Architect.
 2. Observer subject to approval of Owner.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

END OF SECTION

SECTION 01 6000 - PRODUCT REQUIREMENTS

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 00 2600 - Procurement Substitution Requirements: Requests for substitution during the bidding process.
- B. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- C. Section 01 4000 - Quality Requirements: Product quality monitoring.
- D. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- E. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 DEFINITIONS

- A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.
 - 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 2. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - 3. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work.
 - 4. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.04 SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 30 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.

- B. 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.
- C. 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.
- D. 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.
- E. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.

1.05 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
 - 1. Each prime Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate Contractors.
 - 2. If a dispute arises between prime Contractors over concurrently selectable, but incompatible products, the Architect will determine which products shall be retained and which are incompatible and must be replaced.
- C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.
- D. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.
- E. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface which is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - 1. Name of product and manufacturer.
 - 2. Model and serial number.
 - 3. Capacity.
 - 4. Speed.
 - 5. Ratings.
- F. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.
 - 1. Good: Product-specific; compliant with ISO 14044.
 - 2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.

3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.
 4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.
- G. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.
- H. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber sourced and labeled by an organization accredited by one of the following:
1. Wood sourced from a sustainable harvested location. Submit any documentation available.
 2. Chain of Custody documents are not required.

PART 2 PRODUCTS

2.01 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.
1. Provide products complete with all accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and for the intended use and effect.
 2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
- B. Product Selection Procedures: Product selection is governed by the Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include the following:
1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
 2. Semi proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
 - a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Documents provisions concerning "substitutions" to obtain approval for use of an unnamed product.
 3. Descriptive Specification Requirements: Where specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
 4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
 - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
 5. Compliance with Standards, Codes, and Regulations: Where the Specifications only require compliance with an imposed code, standard, or regulation select a product that complies with the standards, codes, or regulations specified.

6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
7. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.

2.02 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.

2.03 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 using or containing CFC's or HCFC's.
 2. Made of wood from newly cut old growth timber.
 3. Containing lead, cadmium, or asbestos.
- 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 6116.
 2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
 3. Are extracted, harvested, and/or manufactured closer to the location of the project.
 4. Have longer documented life span under normal use.
 5. Result in less construction waste. See Section 01 7419
 6. Are made of vegetable materials that are rapidly renewable.
 7. Are made of recycled materials.
 8. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.
 9. Have a published Environmental Product Declaration (EPD).
 10. Have a published Health Product Declaration (HPD).
 11. Are Living Building Challenge Red List Free.
 12. Have a published Declare Label.

2.04 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.

2.05 MAINTENANCE MATERIALS

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

- B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

- A. See Section 01 2500 - Substitution Procedures.

3.02 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.

3.03 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.

3.04 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 7419.
- 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. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

- H. Comply with manufacturer's warranty conditions, if any.
- I. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

3.05 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
- B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 01 6116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT

RESTRICTIONS

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 3000 - Administrative Requirements: Submittal procedures.
- B. Section 01 4000 - Quality Requirements: Procedures for testing and certifications.
- C. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

1.03 DEFINITIONS

- A. Indoor-Emissions-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.
 - 3. Flooring.
 - 4. Composite wood.
 - 5. Products making up wall and ceiling assemblies.
 - 6. Other products when specifically stated in the specifications.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1. Interior paints and coatings applied on site.
 - 2. Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3. Wet-applied roofing and waterproofing.
 - 4. Other products when specifically stated in the specifications.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1. Concrete.
 - 2. Metals that are plated, anodized, or powder-coated.
 - 3. Glass.
 - 4. Ceramics.
 - 5. Solid wood flooring that is unfinished and untreated.

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; 2025.
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2; 2017.
- D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; Current Edition.
- E. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.
- F. CHPS (HPPD) - High Performance Products Database; Current Edition.
- G. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- H. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).
- I. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).
- J. SCS (CPD) - SCS Certified Products; Current Edition.
- K. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 - 1. Wet-Applied Products: State amount applied in mass per surface area.
 - 2. Paints and Coatings: Test tinted products, not just tinting bases.
 - 3. Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.
 - e. Current CRI (GLP) certification.
 - f. Test report showing compliance and stating exposure scenario used.
 - 4. Product data submittal showing VOC content is NOT acceptable evidence.
 - 5. Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. 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. Published product data showing compliance with requirements.
- C. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.
 - 1. Evidence of Compliance: Acceptable types of evidence are:

- a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scs-certified.com.
 - b. Report of laboratory testing performed in accordance with requirements.
 - c. Published product data showing compliance with requirements.
- D. 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. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
 - 1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.
 - 2. Inherently Non-Emitting Materials.
- C. 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).
 - 4. Wet-Applied Roofing and Waterproofing: Comply with requirements for paints and coatings.

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.

END OF SECTION

SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
- C. Cutting and patching.
- 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 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- E. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 SUBMITTALS

- A. See Section 01 3000 - 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.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- C. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

1.06 COORDINATION

- A. See Section 01 1000 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 6000 - 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. Promptly notify Architect of any discrepancies discovered.

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 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- C. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2. Remove items indicated on drawings.
 - 3. Relocate items indicated on drawings.
 - 4. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 - 5. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- D. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.

2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. See Section 01 1000 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- E. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
 3. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
 4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- H. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- I. Clean existing systems and equipment.
- J. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- K. Do not begin new construction in alterations areas before demolition is complete.
- L. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

- A. Whenever possible, execute the work by methods that avoid cutting or patching.
- B. See Alterations article above for additional requirements.
- C. 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.
- D. 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.
 - E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
 - F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
 - G. Restore work with new products in accordance with requirements of Contract Documents.
 - H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 - I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
 - J. 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.

3.07 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.

3.08 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.

3.09 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
- E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.11 ADJUSTING

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

3.12 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 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.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
- 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.

3.14 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.

END OF SECTION

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project be proactive on generating less trash and waste.
- 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. 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: May be used as blocking or furring.
 - 5. 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.
- E. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- F. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: List of items to be salvaged from the existing building for relocation in project or for Owner.
- B. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.
- C. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.
- D. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.
- E. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- C. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

END OF SECTION

SECTION 01 7800 - CLOSEOUT SUBMITTALS

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 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 01 7000 - 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. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one 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 one copy of completed documents 15 days prior to final inspection. This copy 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 two sets of revised final documents in final form within 10 days after final inspection.
- C. 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.

5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by 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. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 3. Field changes of dimension and detail.
 4. 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. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. 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. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
 - D. Include color coded wiring diagrams as installed.
 - E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - G. Provide servicing and lubrication schedule, and list of lubricants required.
 - H. Include manufacturer's printed operation and maintenance instructions.
 - I. Include sequence of operation by controls manufacturer.
 - J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - K. Provide control diagrams by controls manufacturer as installed.
 - L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
 - M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - O. Include test and balancing reports.
 - P. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.
 - 4. Design Data: To allow for addition of design data furnished by Architect or others, provide a tab labeled "Design Data" and provide a binder large enough to allow for insertion of at least 20 pages of typed text.

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.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 02 4100 - DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 7000 - 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.
- C. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.
- D. Section 31 2323 - Building Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with requirements in Section 01 7000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Comply with applicable requirements of NFPA 241.
 - 3. Use of explosives is not permitted.
 - 4. 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.
 - 5. Provide, erect, and maintain temporary barriers and security devices.
 - 6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 9. 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.
 - 10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.

- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. 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.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- G. Perform demolition in a manner that maximizes salvage and recycling of materials.
 - 1. Comply with requirements of Section 01 7419 - Construction Waste Management and Disposal.
 - 2. Dismantle existing construction and separate materials.
 - 3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.02 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.03 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Separate areas in which demolition is being conducted from areas that remain occupied.
 - 1. Provide, erect, and maintain temporary dustproof partitions of construction indicated on drawings .
- C. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- D. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
 - 2. Remove items indicated on drawings.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.

2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch to match new work.

3.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 2000 - CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI MNL-66 - ACI Detailing Manual; 2020.
- B. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2024.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- E. CRSI (DA4) - Manual of Standard Practice; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI MNL-66 Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that products supplied for this project meet or exceed specified requirements.
- D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.05 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
- B. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces, unless noted otherwise on Structural drawings. Wood materials are prohibited.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

- B. Welding of reinforcement is not permitted.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
 - 1. Review locations of splices with Structural Engineer.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
 - 1. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- B. Do not cut, puncture, displace or damage vapor barrier. Repair damage and reseal vapor retarder before placing concrete.
- C. Accommodate placement of formed openings.
- D. Comply with applicable code for concrete cover over reinforcement.
- E. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.02 FIELD QUALITY CONTROL

- A. An independent testing agency, as specified in Section 01 4000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete formwork.
- B. Floors and slabs on grade.
- C. Concrete foundation walls.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including equipment pads.
- F. Concrete curing.

1.02 RELATED REQUIREMENTS

- A. Section 03 2000 - Concrete Reinforcing.
- B. Section 07 9200 - 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 C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- K. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.
- L. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- M. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2016a.
- N. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- O. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- P. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.
- Q. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.
- R. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.
- S. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.

- T. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- U. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004, with Editorial Revision (2013).
- V. ASTM D2103 - Standard Specification for Polyethylene Film; 2023a.
- W. 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; 2024.
- X. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).
- Y. COE CRD-C 513 - Handbook for Concrete and Cement Corps of Engineers Specifications for Rubber Waterstops; 1974.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Employ an independent testing laboratory to test proposed aggregate and design concrete mixes for each type of concrete required.
 - 2. Submit aggregate test reports and mix designs for approval 14 days prior to placing concrete.
 - 3. Test each type of fine and coarse aggregate for conformance to ASTM C33-78.
 - 4. Design mixes in accordance with ACI 301, Section 3.8.2, Method 1 or Method 2.
 - 5. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Test Reports: Submit report for each test or series of tests specified.
- F. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- G. 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.

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. Form Facing for Exposed Finish Concrete: Contractor's choice of materials that will provide smooth, stain-free final appearance.
2. Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
3. Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.
4. Form Ties: Cone snap type that will leave no metal within 1-1/2 inches (38 mm) of concrete surface.

2.02 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 2000.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I/II Portland type, unless noted otherwise in Structural Drawings.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 1. Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
- E. Structural Fiber Reinforcement: ASTM C1116/C1116M.

2.04 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.05 ACCESSORY MATERIALS

- A. Underslab Vapor Retarder (VPR RET-4):
 1. Sheet Material: ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Single-ply polyethylene is prohibited.
 2. Permeance of less than 0.01 perms as tested in accordance with ASTM F 1249.
 3. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 4. Products:
 - a. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com.
 - b. Poly-America; Husky Yellow Guard 15-mil Vapor Barrier: www.yellowguard.com.
 - c. Stego Industries, LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com.
 - d. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils (0.38 mm): www.wrmeadows.com.
 - e. Viaflex; VaporBlock VB 15: www.viaflex.com.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
- B. Non-Shrink Cementitious Grout: Premixed compound consisting of nonmetallic aggregate, cement, water reducing and plasticizing agents.
 1. Grout: Comply with ASTM C1107/C1107M.
 2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch (13.7 MPa).
 3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch (48 MPa).

2.06 BONDING AND JOINTING PRODUCTS

- A. Waterstops: Rubber, complying with COE CRD-C 513.

1. Configuration: As indicated on drawings.
2. Size: As indicated on drawings.
- B. Slab Isolation Joint Filler: 1/2-inch (13 mm) thick, height equal to slab thickness, with removable top section forming 1/2-inch (13 mm) deep sealant pocket after removal.
 1. Material: ASTM D1751, cellulose fiber.
- C. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches (150 mm) on center; ribbed steel stakes for setting.

2.07 CURING MATERIALS

- A. Curing and Sealing Compound, Low Gloss (CSLR-1): Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
 1. Apply in accordance with manufacturer's instructions during concrete curing.
 2. Near Substantial Completion, apply a final coat(s) to produce a consistent, uniform low gloss finish to floor areas indicated to receive (CSLR-1).
 3. Solids by Mass: 25 percent, minimum.
 4. Products:
 - a. Dayton Superior Corporation; Cure & Seal 1315 J22WB: www.daytonsuperior.com.
 - b. TCC Materials; Tenon Cure & Seal WB 1315: www.tccmaterials.com.
 - c. W. R. Meadows, Inc; VOCOMP-25: www.wrmeadows.com.
 - d. BASF; Kure 1315: www.buildingsystems.basf.com.
 - e. Scofield; Cureseal-W: www.scofield.com.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
- B. Moisture-Retaining Sheet: ASTM C171.
 1. Curing paper, regular.
 2. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard (1.71 kg/sq m).
- C. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch (0.102 mm) thick, clear.
- D. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
- B. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.
- C. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard (0.89 kg per cu m), or as recommended by manufacturer for specific project conditions.

2.09 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- 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. Formwork: Comply with requirements of ACI SPEC-301. Design and fabricate forms to support all applied loads until concrete is cured and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. 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.
- E. 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.
- F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches (150 mm). Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI PRC-304.
- B. Notify Architect not less than 24 hours prior to commencement of placement operations.
- C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.04 SLAB JOINTING

- A. Locate joints as indicated on drawings.
- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - 1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch (5 mm) thick blade and cut at least 1 inch (25 mm) deep but not less than one quarter (1/4) the depth of the slab.
- E. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch (6 mm) in 10 feet (3 m).
 - 2. Under Seamless Resilient Flooring: 1/4 inch (6 mm) in 10 feet (3 m).
 - 3. Under Carpeting: 1/4 inch (6 mm) in 10 feet (3 m).
- B. Correct the slab surface if tolerances are less than specified.

- C. 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.

3.06 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch (6 mm) or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch (6 mm) or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:50 nominal, unless noted otherwise in the drawings.

3.07 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.

3.08 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards (76 cu m) or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.09 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.10 PROTECTION

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

END OF SECTION

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- C. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- D. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.
- E. ASTM C90 - Standard Specification for Dry-Cast Loadbearing Concrete Masonry Units; 2024a.
- F. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
- H. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2024a.
- I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2017.
- J. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- L. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- M. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- N. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- O. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2017.
- P. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength; 2013, with Editorial Revision (2014).
- Q. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2016.
- R. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry; 2014a.
- S. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- T. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- U. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 SUBMITTALS

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

- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
 - 2. Special Shapes: Provide nonstandard blocks configured for corners.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block.
 - 4. Nonloadbearing Units: ASTM C129.
 - a. Hollow block.
 - 5. Patterns and Faces:
 - a. (CMU-1): Manufacturer's standard color and texture.
 - b. (RMU-10): Rock faced; integral color as selected from manufacturer's full range.
 - c. Supplier of prefinished or integrally colors units shall guarantee that the finished product will not be stained or damaged due to iron or shale deposits in the face for a period of 5 years.
 - 6. Units with Integral Water Repellent: Concrete block units as specified in this section with polymeric liquid admixture added to concrete masonry units at time of manufacture.
 - a. Application: Provide integral water repellent in units exposed to the exterior.
 - b. Performance of Units with Integral Water Repellent:
 - 1) Water Permeance: When tested per ASTM E514/E514M and for a minimum of 72 hours.
 - (a) No water visible on back of wall above flashing at the end of 24 hours.
 - (b) No flow of water from flashing equal to or greater than 0.032 gallons per hour (0.05 L per hour) at the end of 24 hours.
 - (c) No more than 25 percent of wall area above flashing visibly damp at end of test.
 - 2) Flexural Bond Strength: ASTM C1072; minimum 10 percent increase.
 - 3) Compressive Strength: ASTM C1314; maximum 5 percent decrease.
 - c. Use only in combination with mortar that also has integral water repellent admixture.
 - d. Use water repellent admixtures for masonry units and mortar by a single manufacturer.

2.03 MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, Type S.
- B. Portland Cement: ASTM C150/C150M, Type I.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Water: Clean and potable.
- G. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.
 - 1. Use only in combination with masonry units manufactured with integral water repellent admixture.
 - 2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
 - 3. Meet or exceed performance specified for water repellent admixture used in masonry units.

2.04 REINFORCEMENT AND ANCHORAGE

- A. Basis of Design: Hohmann & Barnard, Inc; www.h-b.com.
- B. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - 1. Blok-Lok Limited: www.blok-lok.com.
 - 2. WIRE-BOND www.wirebond.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- C. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa), deformed billet bars; galvanized.
- D. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- E. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 - 1. Type: Ladder.
 - 2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
 - 3. Size: 0.1483 inch (3.8 mm) side rods with 0.1483 inch (3.8 mm) cross rods; width as required to provide not less than 5/8 inch (16 mm) of mortar coverage on each exposure.
- F. Brick Ties (BRICK TIE): Provide brick ties listed below at applicable locations. Where no appropriate brick tie is specified for a specific application, coordinate selection with Architect.

2.05 FLASHINGS

- A. Membrane Asphaltic Flashing Materials (TWF-1):
 - 1. Rubberized Asphalt Flashing: Self-adhering polymer modified asphalt sheet, laminated to stainless steel drip; 40 mils (0.040 inch) (1.0 mm) minimum total thickness; 8 mil (0.20 mm) cross-laminated polyethylene bonded to adhesive rubberized asphalt, with a removable release liner. Provide stainless steel termination bar over flashing, fastened at 16 inches on center.
 - a. Basis of Design: York Manufacturing, Inc; York Seal: www.yorkmfg.com.
 - b. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - 1) Advanced Building Products, Inc; Strip-N-Flash: www.advancedbuildingproducts.com.

- 2) Carlisle Coatings & Waterproofing; Product CCW-705-TWF: www.carlisleccw.com.
 - 3) W.R. Grace; Product Perm-A-Barrier Wall Flashing.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
- B. Termination Bars: Stainless steel; compatible with membrane and adhesives.
 - C. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
 - D. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

- A. Preformed Control Joints (CJ-1): Rubber material. Provide with corner and tee accessories, fused joints.
- B. Cavity Mortar Control (MAS ACC-5): Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.
 - a. Manufacturers:
 - 1) Advanced Building Products Inc; Mortar Break: www.advancedbuildingproducts.com/#sle.
 - 2) Mortar Net Solutions: www.mortarnet.com.
 - 3) York Manufacturing, Inc; Weep-Net: www.yorkflashing.com.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
- C. Weeps and Vents (WEEP-1):
 1. Type: Polyester mesh.
 2. Color(s): As selected by Architect from manufacturer's full range.
 3. Basis of Design: Hohmann & Barnard, Inc; Mortar Trap Weep Vents: www.h-b.com.
 4. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - a. Mortar Net Solutions; WeepVent: www.mortarnet.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
 1. Acceptable Products: Contractor's option to achieve the specified results without damage to masonry or surrounding materials, such as Sure Klean by Prosoco or other product with similar properties.
 2. Use in strict accordance with manufacturer's written instructions.

2.07 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

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

- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Mortar Joints: Concave.

3.04 PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- E. Interlock intersections and external corners, except for units laid in stack bond.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Isolate masonry partitions from vertical structural framing members with a control joint.
- I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.05 WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.06 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL AND SINGLE WYTHE MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.
- C. Lap joint reinforcement ends minimum 6 inches (150 mm).

3.08 LINTELS

- A. Install loose steel lintels over openings.

- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Openings over 48 inches not scheduled: Contact Structural Engineer.

3.09 GROUTED COMPONENTS

- A. Follow lap splice requirements as indicated in Structural drawings.

3.10 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.

3.11 TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- C. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

3.12 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.
- C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.
- D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.13 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Clean soiled surfaces with cleaning solution.

3.14 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Structural steel framing members.
- B. Base plates, shear stud connectors.

1.02 RELATED REQUIREMENTS

- A. Section 05 2100 - Steel Joist Framing.
- B. Section 05 3100 - Steel Decking: Support framing for small openings in deck.

1.03 REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2023, with Errata (2025).
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- D. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.
- E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- F. ASTM A563/A563M - Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric); 2021a.
- G. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2022.
- H. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.
- I. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2024.
- J. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.
- K. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.
- L. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions; 2024.
- M. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series; 2017a.
- N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- Q. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- R. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
 - 2. Connections not detailed.

- 3. Indicate cambers and loads.
- 4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

1.05 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- C. Erector: Company specializing in performing the work of this section with minimum five years of experience.
- D. Design connections not detailed on drawings 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.

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. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade A.
- E. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.
- F. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563/A563M nuts and ASTM F436/F436M washers.
- G. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
- J. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

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.
- D. Develop required camber for members.

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.

2.04 SOURCE QUALITY CONTROL

- A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 10 percent of bolts at each connection.
- B. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using one of the following:
 - 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- C. Field weld components and shear studs indicated on shop drawings.
- D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".
- E. Do not field cut or alter structural members without approval of Architect.
- F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 10 percent of bolts at each connection.
- C. Welded Connections: Visually inspect all field-welded connections and test at least 10 percent of welds using one of the following:
 - 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 2100 - STEEL JOIST FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Open web steel joists and shear stud connectors, with bridging, attached seats and anchors.
- B. Loose bearing members, such as plates or angles, and anchor bolts for site placement.
- C. Supplementary framing for floor and roof openings greater than 18 inches (450 mm).

1.02 RELATED REQUIREMENTS

- A. Section 05 1200 - Structural Steel Framing: Superstructure framing.
- B. Section 05 3100 - Steel Decking: Bearing plates and angles.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished; 2024.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.
- E. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film; 2017.
- F. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2024.
- G. ASTM E165/E165M - Standard Practice for Liquid Penetrant Testing for General Industry; 2023.
- H. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2021.
- I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- J. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- K. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2020.
- L. SJI 100 - Standard Specifications for K-Series, LH-Series, and DLH-Series Open Web Steel Joists, and for Joist Girders; 2020.
- M. SJI Technical Digest No. 9 - Handling and Erection of Steel Joists and Joist Girders; 2008.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- O. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate standard designations, joist coding, configurations, sizes, spacings, cambers, locations of joists, joist leg extensions, bridging, connections, and attachments.

1.05 QUALITY ASSURANCE

- A. Design connections not detailed on drawings 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. Perform Work, including that for headers and other supplementary framing, in accordance with SJI 100 Standard Specifications Load Tables and SJI Technical Digest No. 9.

- C. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- D. Erector Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Transport, handle, store, and protect products to SJI requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Joists:
 - 1. Canam Group Inc: www.canam-steeljoists.ws
 - 2. New Millennium Building Systems: www.newmill.com.
 - 3. Nucor-Vulcraft Group: www.vulcraft.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Open Web Joists: SJI Type K Joists:
 - 1. Provide bottom chord extensions as indicated.
 - 2. Finish: Shop primed.
- B. Anchor Bolts, Nuts and Washers: ASTM A307 hot-dip galvanized per ASTM A153/A153M Class C.
- C. Shear Stud Connectors: Made from ASTM A108 Grade 1015 bars.
- D. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36/A36M.
- E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.03 FINISH

- A. Shop prime joists as specified.
 - 1. Do not prime surfaces that will be fireproofed, field welded, or in contact with concrete.
- B. Prepare surfaces to be finished in accordance with SSPC-SP 2.

2.04 SOURCE QUALITY CONTROL

- A. Provide shop testing of steel components as follows:
- B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 10 percent of bolts at each connection.
- C. Welded Connections: Visually inspect all shop-welded connections and test at least 10 percent of welds using one of the following:
 - 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.02 ERECTION

- A. Erect joists with correct bearing on supports.
- B. Allow for erection loads. Provide sufficient temporary bracing to maintain framing safe, plumb, and in true alignment.
- C. Coordinate the placement of anchors for securing loose bearing members furnished as part of the work of this section.
- D. After joist alignment and installation of framing, field weld joist seats to steel bearing surfaces.
- E. Position and field weld joist chord extensions and wall attachments as detailed.
- F. Install supplementary framing for floor and roof openings greater than 18 inches (450 mm).
- G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- H. Do not field cut or alter structural members without approval of joist manufacturer.
- I. After erection, prime welds, damaged shop primer, damaged galvanizing, and surfaces not shop primed , except surfaces specified not to be primed.

3.03 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm).
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 10 percent of bolts at each connection.
- C. Welded Connections: Visually inspect all field-welded connections and test at least 10 percent of welds using one of the following:
 - 1. Radiographic testing performed in accordance with ASTM E94/E94M.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.

END OF SECTION

SECTION 05 3100 - STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof deck.
- B. Metal form deck.
- C. Supplementary framing for openings up to and including 18 inches (450 mm).
- D. Bearing plates and angles.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- E. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; 2018, with Errata (2022).
- F. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172; 2019.
- G. SDI (DM) - Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- C. Shop Drawings: Indicate deck plan, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- D. Certificates: Certify that products furnished meet or exceed specified requirements.

1.04 QUALITY ASSURANCE

- A. Design deck layout, spans, fastening, and joints under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.
- B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.
- C. Installer Qualifications: Company specializing in performing the work of this Section with minimum five years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Cut plastic wrap to encourage ventilation.
- B. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Deck:

1. Canam Steel Corporation: www.canam-steeljoists.ws.
2. New Millennium Building Systems: www.newmill.com.
3. Nucor-Vulcraft Group: www.vulcraft.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STEEL DECK

- A. All Deck Types: Select and design metal deck in accordance with SDI Design Manual.
 1. Calculate to structural working stress design and structural properties specified.
 2. Maximum Vertical Deflection of Roof Deck: 1/240 of span.
- B. Roof Deck: Non-composite type, fluted steel sheet:
 1. Ungalvanized Steel Sheet: ASTM A1008/A1008M, Designation SS, Grade 33, Type 1.
 2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
 3. Nominal Height: 1-1/2 inch (38 mm).
 4. Side Joints: Lock seam.
 5. End Joints: Lapped, welded.
- C. Metal Form Deck: Corrugated sheet steel:
 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 2. Provide form deck of size, gauge, depth and profile as shown and noted on drawings.

2.03 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel, unfinished.
- B. Welding Materials: AWS D1.1/D1.1M.
- C. Weld Washers: Mild steel, uncoated, 3/4 inch (19 mm) outside diameter, 1/8 inch (3 mm) thick.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- E. Flute Closures: Closed cell foam rubber, 1 inch (25 mm) thick; profiled to fit tight to the deck.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. On concrete and masonry surfaces provide minimum 4 inch (100 mm) bearing.
- C. On steel supports provide minimum 1-1/2 inch (38 mm) bearing.
- D. Fasten deck to steel support members at ends and intermediate supports at 12 inches (300 mm) on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
 1. Welding: Use fusion welds through weld washers.
- E. Use screw fasteners at seam side laps.
- F. Weld deck in accordance with AWS D1.3/D1.3M.
- G. Where deck (other than cellular deck electrical raceway) changes direction, install 6 inch (150 mm) minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches (300 mm) on center maximum.

- H. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
- I. Close openings above walls and partitions perpendicular to deck flutes with single row of foam cell closures.
- J. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

END OF SECTION

SECTION 05 4000 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formed steel stud exterior wall framing.
- B. Formed steel stud interior wall & floor framing.

1.02 REFERENCE STANDARDS

- A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- E. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- G. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations.
- C. Product Data: For lateral-force resisting systems, provide product data sheets on hold-down, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
 - 1. Describe method for securing studs to tracks and for bolted framing connections.
- E. Manufacturer's Qualification statement.

1.04 QUALITY ASSURANCE

- A. Designer Qualifications: Design framing system under direct supervision of a professional structural engineer experienced in designing this work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications:
 - 1. Company specializing in manufacturing the types of products specified in this section, and with minimum 3 years of documented experience.
 - 2. Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

- C. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Structural Framing:
 - 1. CEMCO: www.cemcosteel.com.
 - 2. ClarkDietrich: www.clarkdietrich.com.
 - 3. MarinoWARE: www.marinoware.com.
 - 4. SCAFCO Corporation: www.scafco.com.
 - 5. The Steel Network, Inc: www.SteelNetwork.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Connectors:
 - 1. Same manufacturer as metal framing.
 - 2. ClarkDietrich: www.clarkdietrich.com.
 - 3. MarinoWARE: www.marinoware.com.
 - 4. Simpson Strong Tie: www.strongtie.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

- A. Design Requirements: Design cold-formed framing systems, components and connectors to withstand specified design loads in compliance with ICC (IBC), ASCE 7, AISI S100, and AISI S240.

2.03 MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
 - 1. Corrosion Protection Coating Designation: CP 90 in accordance with AISI S240.

2.04 STRUCTURAL FRAMING COMPONENTS

- A. Wall Studs and Track Sections (MET STUD-1): AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.
 - 1. Thickness and Depth: As indicated on drawings.

2.05 MISCELLANEOUS CONNECTIONS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot-dip galvanized per ASTM A153/A153M.
- B. Welding: Comply with AWS D1.1/D1.1M.

2.06 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed sheet steel, thickness determined for conditions encountered; finish to match framing components.
- B. Galvanizing Repair: Touch up bare steel with zinc-rich paint in compliance with ASTM A780/A780M.
- C. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch (6 mm) thick, plate width, closed cell plastic foam from continuous rolls.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION - GENERAL

- A. Install structural members and connections in compliance with ASTM C1007.

3.03 INSTALLATION OF STUDS

- A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- B. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.
- C. Install load-bearing studs full length in one piece. Splicing of studs is not permitted.
- D. Install load-bearing studs; brace, and reinforce to develop full strength and achieve design requirements.
- E. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- F. Install intermediate studs above and below openings to align with wall stud spacing.
- G. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.
- H. Install framing between studs for attachment of mechanical and electrical items, and to prevent stud rotation.

END OF SECTION

SECTION 05 5100 - METAL STAIRS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stairs with concrete treads.
- B. Structural steel stair framing and supports.
- C. Handrails and guards.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete fill in stair pans; mesh reinforcement for landings.
- B. Section 03 3000 - Cast-in-Place Concrete: Placement of metal anchors in concrete.
- C. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

1.03 REFERENCE STANDARDS

- A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures; 2006.
- B. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2024b.
- 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; 2024.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2024.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- H. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2021.
- I. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- J. 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.
- K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- N. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 2004.
- O. SSPC-SP 2 - Hand Tool Cleaning; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - 2. Include the design engineer's seal and signature on each sheet of shop drawings.

1.05 QUALITY ASSURANCE

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
- B. Fabricator Qualifications:
 - 1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.01 METAL STAIRS - GENERAL

- A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, railings, and guards, fabricated accurately for anchorage to each other and to building structure.
 - 1. Regulatory Requirements: Provide stairs and railings that comply with most stringent requirements of local, state, and federal regulations; where requirements of Contract Documents exceed those of regulations, comply with Contract Documents.
 - 2. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 3. Structural Design: Provide complete stair and railing assemblies that comply with the applicable local code.
 - 4. Dimensions: As indicated on drawings.
 - 5. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
 - 6. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
 - 7. Separate dissimilar metals using paint or permanent tape.
- B. Metal Jointing and Finish Quality Levels:
 - 1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
 - a. Welded Joints: Continuously welded and ground smooth and flush.
 - b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
 - c. Exposed Edges and Corners: Eased to small uniform radius.
 - d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.
- C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.
- D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 METAL STAIRS WITH CONCRETE TREADS

- A. Jointing and Finish Quality Level: Architectural, as defined above.
- B. Risers: Closed.
- C. Treads: Metal pan with field-installed concrete fill.
 - 1. Concrete Depth: 1-1/2 inches (38 mm), minimum.
 - 2. Tread Pan Material: Steel sheet.
 - 3. Tread Pan Thickness: As required by design; 14 gauge, 0.075 inch (1.9 mm) minimum.
 - 4. Concrete Reinforcement: Welded wire mesh.
 - 5. Concrete Finish: For resilient floor covering.
- D. Risers: Same material and thickness as tread pans.
 - 1. Nosing Depth: Not more than 1-1/2 inch (38 mm) overhang.
 - 2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch (12 mm) wide.
- E. Stringers: Steel plate.
 - 1. Stringer Depth: 12 inches (305 mm).
- F. Landings: Similar construction, using corrugated steel decking, supported and reinforced as required to achieve design load capacity.
- G. Railings: Steel picket railings.
- H. Finish: Shop- or factory-prime painted.
- I. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.03 HANDRAILS AND GUARDS

- A. Wall-Mounted Rails: Round pipe or tube rails unless otherwise indicated.
 - 1. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
- B. Guards:
 - 1. Top Rails: Round pipe or tube rails unless otherwise indicated.
 - a. Outside Diameter: 1-1/4 inch (32 mm), minimum, to 1-1/2 inches (38 mm), maximum.
 - 2. Infill at Picket Railings: Vertical pickets.
 - a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
 - b. Material: Solid steel bar.
 - c. Shape: Square.
 - d. Size: 3/4 inch (19 mm) square.
 - e. Top Mounting: Welded to underside of top rail.
 - f. Bottom Mounting: Welded to top surface of stringer.
 - 3. End and Intermediate Posts: Same material and size as top rails.
 - a. Horizontal Spacing: As indicated on drawings.
 - b. Mounting: Welded to top surface of stringer.

2.04 MATERIALS

- A. Steel Sections: ASTM A36/A36M.
- B. Steel Tubing: ASTM A500/A500M or ASTM A501/A501M structural tubing, round and shapes as indicated.
- C. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
- D. Pipe: ASTM A53/A53M Grade B Schedule 40, black finish.

- E. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 - 1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 - 2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
- F. Concrete Fill: See Section 03 3000.

2.05 ACCESSORIES

- A. Steel Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, and galvanized to ASTM A153/A153M where connecting galvanized components.
- B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- C. Shop and Touch-Up Primer: SSPC-Paint 15, and comply with VOC limitations of authorities having jurisdiction.

2.06 SHOP FINISHING

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact with concrete or where field welding is required.
- C. Prime Painting: Use specified shop- and touch-up primer.
 - 1. Preparation of Steel: In accordance with SSPC-SP 2 Hand Tool Cleaning.
 - 2. Number of Coats: One.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. When field welding is required, clean and strip primed steel items to bare metal.
- B. Supply items required to be cast into concrete and embedded in masonry with setting templates.

3.03 INSTALLATION

- A. Install components plumb and level, accurately fitted, free from distortion or defects.
- B. Provide anchors, plates, angles, and hangers required for connecting stairs to structure.
- C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Provide welded field joints where specifically indicated on drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
- F. Obtain approval prior to site cutting or creating adjustments not scheduled.
- G. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 5213 - PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Placement of anchors in concrete.

1.03 REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Allow for expansion and contraction of members and building movement without damage to connections or members.
- C. Dimensions: See drawings for configurations and heights.
- D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
- E. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

- A. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, galvanized finish.
- B. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- D. Exposed Fasteners: No exposed bolts or screws.
- E. Galvanizing: In accordance with requirements of ASTM A123/A123M.

2.03 FABRICATION

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured.
- D. Welded Joints:
 - 1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
 - 2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
 - 3. 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.
- E. Weld connections that cannot be shop welded due to size limitations.
 - 1. Weld in accordance with AWS D1.1/D1.1M.
 - 2. Match shop welding and bolting.
 - 3. Clean welds, bolted connections, and abraded areas.
 - 4. Touch up shop primer and factory-applied finishes.
 - 5. Repair galvanizing with galvanizing repair paint per ASTM A780/A780M.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 PREPARATION

- A. Supply items required to be cast into concrete with setting templates, for installation as work of other sections.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Anchor railings securely to structure.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

END OF SECTION

SECTION 05 7000 - DECORATIVE METAL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Railing and guardrail assemblies.
- B. Wall-mounted handrails.

1.02 RELATED REQUIREMENTS

- A. Section 08 8000 - Glazing: Glass.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- F. 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.
- G. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2025.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.
- I. AWS D1.6/D1.6M - Structural Welding Code - Stainless Steel; 2017, with Amendment (2021).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, finishes, fabrication details, anchors, and accessories.
- C. Shop Drawings: Indicate elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- D. Test Reports: Submit test reports from independent testing agency showing compliance with specified design and performance requirements.
- E. Maintenance Data: Manufacturer's instructions for care and cleaning.
- F. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Templates: Supply installation templates, reinforcing, and required anchorage devices.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in factory-provided protective coverings and packaging.

- B. Protect materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect materials for damage upon delivery. Replace damaged and unrepairable materials. Ensure replacement materials are indistinguishable from undamaged parts and finishes.
- D. Prior to installation, store materials and components under cover in a dry location.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperature of space at minimum 65 degrees F (18.3 degrees C) and maximum 95 degrees F (35 degrees C) for 24 hours before, during, and after installation.

1.08 WARRANTY

- A. Manufacturer Warranty: Provide 2-year manufacturer warranty for defects in materials, fabrication, finishes, and installation. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MATERIALS

- A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.
- B. Steel Components:
 - 1. Sections, Shapes, Plate and Bar: ASTM A36/A36M.
 - 2. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
 - a. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
 - b. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
 - 3. Welding Materials: Comply with AWS D1.1/D1.1M.
- C. Stainless Steel Components:
 - 1. Section, Plates: ASTM A666, Type 304.
 - 2. Stainless Steel Bars, Shapes and Moldings: ASTM A276/A276M, Type 304.

2.02 RAILING SYSTEMS

- A. Railing Systems - General: Factory- or shop-fabricated in design indicated, to suit specific project conditions, and for proper connection to building structure, and in largest practical sizes for delivery to site.
 - 1. Performance Requirements: Design and fabricate railings and anchorages to resist the following loads without failure, damage, or permanent set; loads do not need to be applied simultaneously.
 - a. Lateral Force: 75 lb (333 N) minimum, at any point, when tested in accordance with ASTM E935.
 - b. Distributed Load: 50 lb/ft (0.73 kN per m) minimum, applied in any direction at the top of the handrail, when tested in accordance with ASTM E935.
 - c. Concentrated Loads on Intermediate Rails: 50 psf (0.22 kgs per sq m), minimum.
 - d. Concentrated Load: 200 lbs (888 N) minimum, applied in any direction at any point along the handrail system, when tested in accordance with ASTM E935.
 - e. Handrails: Comply with applicable accessibility requirements of ADA Standards.
 - 2. Assembly: Join lengths, seal open ends, and conceal exposed mounting bolts and nuts using slip-on non-weld mechanical fittings, flanges, escutcheons, and wall brackets.
 - 3. Joints: Tightly fitted and secured, machined smooth with hairline seams.
 - 4. Field Connections: Provide sleeves to accommodate site assembly and installation.

5. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
 - a. Ease exposed edges to a small uniform radius.
 - b. Welded Joints:
 - 1) Carbon Steel: Perform welding in accordance with AWS D1.1/D1.1M.
 - 2) Stainless Steel: Perform welding in accordance with AWS D1.6/D1.6M.
- B. Metal Railing: Engineered, post-supported railing system with metal infill.
 1. Configuration: Guardrail with separate handrail.
 2. Top Rail: 2 inch (51 mm) diameter pipe or tube.
 3. Grip Rail: Round, stainless steel, 1-1/2 inch (38 mm) diameter.
 4. Decorative Flanges for Embedded Posts: Circular, collared cover plate without screw holes.
 5. Infill at Picket Railings: Vertical pickets.
 6. Wall Mounted Components: Components necessary to support railing with 1-1/2 inch (38 mm) clearance from wall, and as follows:
 - a. Horizontal Spacing: Maximum 4 inches (100 mm) on center.
 - b. Material: Solid steel bar.
 - c. Shape: Square.
 - d. Size: 3/4 inch (19 mm) square.
 - e. Top Mounting: Welded to underside of top rail.
 - f. Bottom Mounting: As indicated on drawings.
- C. Wall-Mounted Handrail:
 1. 1-1/2 inch (38 mm) diameter stainless steel; No. 4 bright finish.
 2. Handrail Brackets: Manufacturer's standard stainless steel brackets.
 - a. Finish: No. 4 bright finish.
 3. Comply with ADA Standards.
- D. Cable Railing System:
 1. Description: Post and cable railing system.
 2. Configuration: Guardrail with separate handrail.
 3. Stainless Steel Tube: Type 304 stainless steel.
 4. Cable: ASTM A555/A555M.
 - a. Fabricate from ASTM A666 stainless steel, Type 304.
 - b. Size: 3/16 inch (5 mm) diameter.
 5. Fittings: Type 304 stainless steel.
 6. Fasteners: Stainless steel.
 7. Finishes:
 - a. Exposed, Machined Stainless Steel Fittings: No. 4 bright finish.
- E. Cable Railing System:
 1. 1-1/2 inch (38 mm) diameter stainless steel; No. 4 bright finish.
 2. Handrail Brackets: Manufacturer's standard stainless steel brackets.
 - a. Finish: No. 4 bright finish.
 3. Comply with ADA Standards.

2.03 ACCESSORIES

- A. Welding Fittings: Factory- or shop-welded from matching pipe or tube; joints and seams ground smooth.

- B. Anchors and Fasteners: Provide anchors, fasteners, and other attachment devices required to attach to structure. Ensure attachment devices are of same material as components unless indicated otherwise.
- C. Anchors and Fasteners: Provide anchors and other materials as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
 - 1. For anchorage to concrete, provide inserts to be cast into concrete for bolt anchors.
 - 2. For anchorage to masonry, provide brackets to be embedded in masonry for bolt anchors.
 - 3. For anchorage to stud walls, provide backing plates for bolt anchors.
 - 4. Exposed Fasteners: No exposed bolts or screws.
- D. Carbon Steel Bolts and Nuts: ASTM A307.
- E. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 0.015 inch (0.4 mm) dry film thickness per coat.
- F. Finish Touch-Up Materials: As recommended by manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate and site conditions are acceptable and ready to receive work.
- B. Verify field dimensions of locations and areas to receive work.
- C. Notify Architect immediately of conditions that would prevent satisfactory installation.
- D. Do not proceed with work until detrimental conditions have been corrected.
- E. Furnish components to be installed in other work to installer of that other work, including but not limited to blocking, sleeves, inserts, anchor bolts, embedded plates, and supports for attachment of anchors.

3.02 PREPARATION

- A. Protect existing work.
- B. Review installation drawings before beginning installation. Coordinate diagrams, templates, instructions, and directions for installation of anchorages and fasteners.
- C. Clean surfaces to receive units. Remove materials and substances detrimental to installation.

3.03 INSTALLATION

- A. Comply with manufacturer's drawings and written instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.
- C. Anchor securely to structure.
- D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.
- E. Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

3.05 CLEANING

- A. Remove protective film from exposed metal surfaces.
- B. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents, or other substances that may damage the material or finish.

3.06 PROTECTION

- A. Protect installed components and finishes from damage after installation.
- B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
 - 1. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

SECTION 06 1000 - ROUGH CARPENTRY

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. Roof-mounted curbs.
- E. Preservative treated wood materials.
- F. Fire retardant treated wood materials.
- G. Miscellaneous framing and sheathing.
- H. Concealed wood blocking, nailers, and supports.

1.02 RELATED REQUIREMENTS

- A. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.
- B. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- B. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2017).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- E. PS 1 - Structural Plywood; 2023.
- F. PS 2 - Performance Standard for Wood Structural Panels; 2018.
- G. PS 20 - American Softwood Lumber Standard; 2025.
- H. SPIB (GR) - Grading Rules; 2014.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. 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.
 - 2. 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.
- B. Wood sourced from a sustainably harvested location. Submit any documentation available.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring (WD BLKG):
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

- A. Wall Sheathing: Plywood, PS 1, Grade C-D, Exposure I.
 - 1. (WD SHTG-30): 1/2 inch.
 - 2. (WD SHTG-31): 5/8 inch.
 - 3. (WD SHTG-32): 3/4 inch.
 - 4. (WD SHTG-32F): 3/4 inch fire retardant treated.
- B. Other Applications:
 - 1. Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 2. Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 - 3. Other Locations: PS 1, C-D Plugged or better.

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 (9.5 mm) thick, closed-cell plastic foam.
 - 1. Width: 3-1/2 inches (89 mm).
 - 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 6200.

2.05 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. 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 AWWA standards.
- B. Fire Retardant Treatment:
 - 1. Exterior Type: AWWA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

- b. Do not use treated wood in direct contact with the ground.
- 2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat rough carpentry items as indicated .
 - c. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
 - 1. Products:
 - 2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - 3. Preservative Pressure Treatment of Plywood Above Grade: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - 4. Preservative Pressure Treatment of Lumber in Contact with Soil: AWPA U1, Use Category UC4A, Commodity Specification A.
 - a. Preservative for Field Application to Cut Surfaces: As recommended by manufacturer of factory treatment chemicals for brush-application in the field.
 - b. Restrictions: Do not use lumber or plywood treated with chromated copper arsenate (CCA) in exposed exterior applications subject to leaching.

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 (100 mm) 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.

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 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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

- C. 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.

3.04 INSTALLATION OF CONSTRUCTION PANELS

- A. Wall Sheathing: Secure with long dimension in the most efficient direction to wall studs, with ends over firm bearing and staggered, using nails or screws.

3.05 CLEANING

- A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 2000 - FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood door frames, glazed frames.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Painting of finish carpentry items.
- B. Section 09 9300 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

1.03 REFERENCE STANDARDS

- A. NHLA G-101 - Rules for the Measurement and Inspection of Hardwood and Cypress; 2023.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Samples: Submit two samples of finish plywood, 6 by 6 inch (152 by 152 mm) in size illustrating wood grain and specified finish.
- C. Samples: Submit two samples of wood trim 6 inch (152 mm) long.

1.05 QUALITY ASSURANCE

- A. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements for requirements.

PART 2 PRODUCTS

2.01 SUSTAINABILITY CHARACTERISTICS

- A. Wood sourced from a sustainably harvested location. Submit any documentation available.
- B. Provide composite wood containing no added formaldehyde. See Section 01 6116.

2.02 LUMBER MATERIALS

- A. Hardwood Lumber (WDT-1): Maple species, plain sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.
 - 1. Grading: In accordance with NHLA G-101 Grading Rules; www.nhla.com.

2.03 FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

2.04 ACCESSORIES

- A. Primer: Alkyd primer sealer.
- B. Wood Filler: Solvent base, tinted to match surface finish color.

2.05 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.
- D. Install components with finish nails, unless noted otherwise.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 9123 and 09 9300.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch (1.6 mm).
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 06 4100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Hardware.

1.02 RELATED REQUIREMENTS

- A. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2022.
- B. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- C. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot (125 mm to 1 m), minimum.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet substrate and finish.

1.05 QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Cabinets (WDV-#):
 - 1. Basis of Design: See drawings for product information.
 - 2. Finish - Exposed Exterior Surfaces: Wood.
 - 3. Finish - Exposed Interior Surfaces: Wood.
 - 4. Finish - Semi-Exposed Surfaces: Wood
 - 5. Finish - Concealed Surfaces: Manufacturer's option.
 - 6. Door and Drawer Front Edge Profiles: Square edge with thick applied band.
 - 7. Casework Construction Type: Type A - Frameless.

8. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 9. Grained Face Layout for Cabinet and Door Fronts: Flush panel.
 - a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
 10. Adjustable Shelf Loading: 50 lbs. per sq. ft.
 - a. Deflection: L/144.
- C. Cabinets (PLAM-#):
1. Basis of Design: To match existing. See drawings for product information.
 2. Finish - Exposed Exterior Surfaces: Decorative laminate.
 3. Finish - Exposed Interior Surfaces: Decorative laminate.
 4. Finish - Semi-Exposed Surfaces: Decorative laminate
 5. Finish - Concealed Surfaces: Manufacturer's option.
 6. Door and Drawer Front Edge Profiles: Square edge with thick applied band.
 7. Casework Construction Type: Type A - Frameless.
 8. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 9. Layout for Cabinet and Door Fronts: Flush panel.
 10. Adjustable Shelf Loading: 40 psf (19.5 gm/sq cm).
 - a. Deflection: L/144.

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Wood sourced from a sustainably harvested location. Submit any documentation available.
- C. Provide composite wood containing no added formaldehyde. See Section 01 6116.

2.03 PANEL CORE MATERIALS

- A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.
 1. Grade: M-2; moisture resistance: MR10.

2.04 THERMALLY FUSED LAMINATE PANELS

- A. Thermally Fused Laminate (TFL): Melamine-resin-saturated decorative papers; for fusion to composite wood substrates under heat and pressure.
 1. Panel Core Substrate: Particleboard.

2.05 LAMINATE MATERIALS

- A. Manufacturers:
 1. Formica Corporation: www.formica.com.
 2. Panolam Industries International, Inc: www.panolam.com/#sle.
 3. Wilsonart LLC: www.wilsonart.com/#sle.
 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- C. Provide specific types as follows:
 1. Horizontal Surfaces: HGS, 0.048 inch (1.22 mm) nominal thickness.
 2. Vertical Surfaces: VGS, 0.028 inch (0.71 mm) nominal thickness.
 3. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness.

4. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.06 COUNTERTOPS

- A. Countertops: See Section 12 3600.

2.07 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded 3 mm PVC, flat shaped; smooth finish; of width to match component thickness.
 1. Color: As selected by Architect from manufacturer's standard range.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.
 1. Provide one grommet for every 5 linear feet of countertop (excluding toilet rooms), unless noted otherwise. Coordinate locations with Architect/Owner.

2.08 HARDWARE

- A. Cabinet Hardware: Comply with BHMA A156.9 for hardware types and grades indicated below:
 1. Hardware Types: As indicated on drawings.
 2. Product Grade: As required by specified woodworking quality grade.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
- C. Drawer and Door Pulls: "U" shaped; to match existing:
 1. Finish: Chrome/Polished.
 2. Style: Wire Pull.
 3. Material: Steel.
 4. Size: 96mm.
- D. Drawer Slides:
 1. Type: Full extension with overtravel.
 2. Static Load Capacity: Heavy Duty grade.
 3. Mounting: Side mounted.
 4. Stops: Integral type.
 5. Features: Provide self closing/stay closed type.
 6. Manufacturers:
 - a. Accuride International, Inc: www accuride.com.
 - b. Grass America Inc: www.grassusa.com.
 - c. Hettich America, LP: www.hettich.com.
 - d. Knap & Vogt Manufacturing Company: www.knapeandvogt.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- E. Hinges: European style concealed self-closing type, steel with nickel-plated finish.
 1. Manufacturers:
 - a. Blum, Inc: www.blum.com/#sle.
 - b. Grass America Inc: www.grassusa.com/#sle.

- c. Hardware Resources: www.hardwareresources.com.
- d. Hettich America, LP: www.hettich.com/sle.
- e. Substitutions: See Section 01 6000 - Product Requirements.

2.09 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- C. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)
 - 1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- D. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

2.10 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. On items to receive transparent finishes, use wood filler matching or blending with surrounding surfaces and of types recommended for applied finishes.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.
- G. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

- A. Adjust installed work.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 4200 - WOOD PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Custom wood veneer paneling.
- B. Shop finishing.

1.02 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on fire-retardant treatment materials and application instructions.
- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect work from moisture damage.
- B. Do not deliver wood materials to project site until building is fully enclosed and interior temperature and humidity are in accordance with recommendations of AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

PART 2 PRODUCTS

2.01 PANELING

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.
- B. Flat Paneling (WDP-#):
 - 1. Species: Maple.
 - 2. Cut: Plain Sawn.
 - 3. Panels: Solid wood, stained.
 - 4. Visible Edges and Reveals: Filled and painted.
 - 5. Outside Corners: Mitered and splined.

2.02 WOOD-BASED MATERIALS - GENERAL

- A. Wood sourced from a sustainably harvested location. Submit any documentation available.

2.03 FABRICATION

- A. Prepare panels for delivery to site, permitting passage through building openings.
- B. Finish exposed edges of panels as specified by grade requirements.

2.04 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:
 - a. Stain: To match existing.
 - b. Sheen: Satin.

2.05 ACCESSORIES

- A. Wood Filler: Tinted to match surface finish color.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Do not begin installation until wood materials have been fully acclimated to interior conditions.
- C. Set and secure materials and components in place, plumb and level, using concealed fasteners wherever possible.

END OF SECTION

SECTION 06 8316 - FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fiberglass reinforced plastic panels.
- B. Trim.

1.02 REFERENCE STANDARDS

- A. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.
- B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. FDA Food Code - Chapter 6 - Physical Facilities; Current Edition.
- E. FM 4880 - Examination Standard for Class 1 Fire Rating of Building Panels or Interior Finish Materials; 2022.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples: Submit two samples 6 by 6 inch (150 by 150 mm) in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Crane Composites, Inc; Glasbord: www.cranecomposites.com.
 - 2. Marlite, Inc; Standard FRP: www.marlite.com.
 - 3. Nudo Products, Inc; FiberLite FRP: www.nudo.com.
 - 4. Panolam Industries International, Inc: www.panolam.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

- A. Wall Panels (FRP-#):
 - 1. Basis of Design: As indicated on drawings.
 - 2. Attachment Method: Adhesive only with trim and sealant in joints.

2.03 MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 - 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
 - 2. Class 1 fire rated when tested in accordance with FM 4880.

- 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- 4. Surface Characteristics and Cleanability: Provide products that are smooth, durable, and easily cleanable, in compliance with FDA Food Code, Chapter 6 - Physical Facilities.
- B. Trim: Aluminum; color coordinating with panel.
- C. Adhesive: Type recommended by panel manufacturer.
- D. Sealant: Type recommended by panel manufacturer; color matching panel.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Board insulation at cavity wall construction, perimeter foundation wall, and exterior wall behind exterior wall finish.
- B. Batt insulation in exterior wall, ceiling, and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

- A. Section 07 2600 - Vapor Retarders: Separate vapor retarder materials.
- B. Section 07 2700 - Air Barriers: Separate air barrier materials.
- C. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

- A. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.
- B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2023.
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.
- E. ASTM C726 - Standard Specification for Mineral Wool Roof Insulation Board; 2024.
- F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

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 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - a. (INSUL-1): Type IV, 25 psi. Provide drainage channels.
 - b. (INSUL-2): Type IV, 25 psi.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
 - 5. Board Edges: Square.
 - 6. Basis of Design: Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com.
 - 7. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - a. DuPont de Nemours, Inc; Styrofoam Brand Square Edge: building.dupont.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 MINERAL FIBER BOARD INSULATION MATERIALS

- A. Mineral Wool Block, Board, or Blanket Thermal Insulation: Complying with ASTM C612 or ASTM C553.
 - 1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
 - 2. Thermal Resistance: R-value (RSI-value) of 4.2 (0.74) per inch at 75 degrees F (24 C), minimum, when tested according to ASTM C518.
 - 3. Maximum Density: 8 pcf (128 kg/cu m), nominal.
 - 4. (INSUL-25) Basis of Design: Thermafiber, Inc; FireSpan: www.thermafiber.com.
 - 5. (INSUL-26) Basis of Design: Thermafiber, Inc; RainBarrier: www.thermafiber.com.
 - 6. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - a. ROCKWOOL; CAVITYROCK: www.rockwool.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 MINERAL FIBER BLANKET INSULATION MATERIALS

- A. Mineral Wool Blanket Thermal Insulation (INSUL-20): Flexible or semi-rigid preformed insulation, complying with ASTM C665.
 - 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. Thermal Resistance: R-value (RSI-value) of 3.8 (0.67) per inch, minimum.
 - 4. Basis of Design: ROCKWOOL (ROXUL, Inc); COMFORTBATT: www.rockwool.com.
 - 5. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - a. Johns Manville: www.jm.com.
 - b. Thermafiber, Inc; UltraBatt FF: www.thermafiber.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORIES

- A. Sheet Vapor Retarder: See Section 07 2600.
- B. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

- C. Insulation Fasteners: Appropriate for purpose intended.
- D. Adhesive: Type recommended by insulation manufacturer for 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. 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.
- B. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

- A. Install boards vertically on walls.
 - 1. Butt edges and ends tightly to adjacent boards and protrusions.
- B. Extend boards over expansion joints, unbonded to wall on one side of joint.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.04 BOARD INSTALLATION AT CAVITY WALLS

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.05 BATT INSTALLATION

- A. Install insulation in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof 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. Coordinate work of this section with requirements for vapor retarder, see Section 07 2600.
- F. Coordinate work of this section with construction of air barrier seal, see Section 07 2700.

3.06 PROTECTION

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

END OF SECTION

SECTION 07 2119 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Foamed-in-place insulation.
- B. Protective intumescent coating.

1.02 REFERENCE STANDARDS

- A. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2025.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- D. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, insulation properties, and preparation requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of experience.
- B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years experience.

1.05 FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.
- B. Do not apply foam when temperature is within 5 degrees F (2.78 degrees C) of dew point.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Foamed-In-Place Insulation (INSUL-36): Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Water Vapor Permeance: Vapor retarder; 2 perms (115 ng/(Pa s sq m)), maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
 - 2. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
 - 3. Air Permeance: 0.04 cfm per square foot (0.2 L/(s/sq m)), maximum, when tested at intended thickness in accordance with ASTM E2178 at 1.57 psf (75 Pa).
 - 4. Closed Cell Content: At least 90 percent.
 - 5. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

6. Products:
 - a. BASF Corporation; SPRAYTITE 81206: www.spf.basf.com/#sle.
 - b. Enverge; NexSeal: www.envergesprayfoam.com.
 - c. Henry Company; PERMAX 2.0: www.henry.com/#sle.
 - d. Huntsman Building Solutions; ProSeal HFO: www.huntsmanbuildingsolutions.com/#sle.
 - e. Johns Manville; JM Corbond IV Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
 - f. Rhino Linings Corporation; ThermalGuard CC2: www.rhinelinings.com/#sle.
 - g. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

- A. Primer: As required by insulation manufacturer.
- B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.
 1. Coating Type: Single component, water-based.
 2. Protected Insulation Type: Spray polyurethane foam (SPF).
 3. Application: Apply using brush, roller, or airless sprayer.
 4. Surface Burning Characteristics: Flame spread/smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
 5. Color: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify work within construction spaces or crevices is complete before insulation application.

3.02 PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Patch damaged areas.
- D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

3.04 PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2600 - VAPOR RETARDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vapor retarders.

1.02 RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with vapor retarders.

1.03 DEFINITIONS

- A. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.
- B. Vapor Retarder Class: A measure of a material or assembly's ability to limit the amount of moisture that passes through that material or assembly. Vapor retarder class is defined using Procedure A, Desiccant Method at 73 degrees F (23 degrees C) and 50 percent Relative Humidity (RH), in accordance with ASTM E96/E96M and ICC (IBC)-2018, as follows:
 - 1. Class I: 0.1 perm or less.
 - 2. Class II: Greater than 0.1 perm to 1.0 perm.
 - 3. Class III: Greater than 1.0 perm to 10 perms.

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 D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- C. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- D. ICC (IBC)-2018 - International Building Code; 2018.
- E. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).

1.05 SUBMITTALS

- A. See Section 01 3000 - 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 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 VAPOR RETARDERS

- A. Underslab Vapor Retarders: See Section 03 3000.
- B. Vapor Retarder Sheet (VPR RET-1): ASTM D4397 polyethylene film, clear.
 - 1. Thickness: 6 mil (0.15 mm).
 - 2. Water Vapor Permeance: As required by referenced standard for thickness specified.
- C. (VPR RET-10): Contractor's option to provide a self-adhesive or liquid applied membrane as described in the following paragraphs.
- D. Vapor Retarder, Self-Adhering Membranes (VPR RET-10): Rubberized asphalt bonded to aluminum foil facer.
 - 1. Thickness: 40 mil, 0.04 inch (1.0 mm), nominal.
 - 2. Vapor Retarder Class I: 0.1 perm (5.72 ng/(Pa s sq m)) or less, when tested in accordance with ASTM E96/E96M, Procedure A.
 - 3. Nail Sealability: Passed nail sealability test in accordance with ASTM D1970/D1970M.
 - 4. System Accessory Products: As recommended by membrane manufacturer.
 - 5. Basis of Design: Henry Company; Blueskin SA LT (Low Temp): www.henry.com/#sle.
 - 6. Other Acceptable Products provided they meet or exceed the Basis of Design performance:
 - a. Carlisle Coatings and Waterproofing; Fire Resist 705FR-A: www.carlisleccw.com/#sle.
 - b. GCP Applied Technologies; Perm-A-Barrier Low Temperature Wall Membrane: www.gcpat.com.
 - c. W. R. Meadows, Inc; Air-Shield: www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- E. Vapor Retarder Coating (VPR RET-10): Liquid applied, resilient, ultra-violet (UV) light resistant coating; associated joint treatment.
 - 1. Water Vapor Permeance: 1.0 perm (57 ng/(Pa s sq m)), maximum, when tested in accordance with ASTM E96/E96M.
 - 2. VOC Content: Less than 6.68 oz/gal (50 g/L), when tested in accordance with 40 CFR 59, Subpart D - EPA Method 24.
 - 3. Suitable for use on concrete, masonry, plywood, and gypsum sheathing.
 - 4. Joint Preparation Treatment: Provide coating manufacturer's recommended method, either tape or reinforcing mesh saturated with coating material.
 - 5. Joint Filler: As recommended by coating manufacturer and suitable to the substrate.
 - 6. Basis of Design: Henry Company; Air-Bloc 16MR: www.henry.com/#sle.
 - 7. Other Acceptable Products provided they meet or exceed the Basis of Design performance:
 - a. Carlisle Coatings and Waterproofing; Fire Resist Barritech NP: www.carlisleccw.com/#sle.
 - b. GCP Applied Technologies; Perm-A-Barrier NPL 10 LT: www.gcpat.com.
 - c. W. R. Meadows, Inc; Air-Shield LSR: www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Vapor Retarder and Adjacent Substrates: As indicated, complying with vapor retarder manufacturer's installation instructions.
- B. Sealant for Cracks and Joints in Substrates: Resilient elastomeric joint sealant compatible with substrates and vapor retarder materials.
 - 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm), nominal thickness.
 - 2. All flashing materials shall be compatible with, and approved by, the membrane manufacturer.
- C. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.
- D. Thinners and Cleaners: As recommended by vapor retarder manufacturer.

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. Vapor Retarders: Install continuous airtight barrier over surfaces indicated, with sealed seams and sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. Mechanically Fastened Sheets - Vapor Retarder On Exterior:
 - 1. Install sheets shingle fashion to shed water, with seams generally horizontal.
 - 2. Overlap seams as recommended by manufacturer, 6 inches (152 mm), minimum.
 - 3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches (305 mm), minimum.
 - 4. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
 - 5. Where stud framing rests on concrete or masonry substrate, extend lower edge of vapor retarder sheet at least 4 inches (102 mm) below bottom of framing and seal to substrate with sealant or approved mounting tape.
 - 6. Install vapor retarder underneath jamb flashings.
 - 7. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.
- E. Mechanically Fastened Sheets - Vapor Retarder On Interior:
 - 1. When insulation is installed within assembly, install vapor retarder over insulation.
 - 2. Anchor to wood framing using large-headed nails or staples at 12 to 18 inches (305 to 460 mm) on center along each framing member covered; cover fasteners with seam tape.

3. Anchor to metal framing using seam tape, adhering at least one-half of tape width to metal substrate.
 4. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, providing an airtight seal.
 5. Locate laps at framing members; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet in shingle fashion to shed water.
 6. Seal entire perimeter to structure, window and door frames, and other penetrations.
 7. Where conduits, pipes, wires, ducts, outlet boxes, and other items are installed within insulation cavity, pass vapor retarder sheet behind these items and over insulation to maintain airtight seal.
- F. 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. Once sheets are in place, press firmly into 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.
- G. Vapor Retarder Coatings:
1. Prepare substrate in accordance with coating manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
 2. Where exterior masonry veneer is being installed, install masonry anchors before installing vapor retarder over masonry; provide airtight seal around anchors.
 3. Apply bead or trowel coat of mastic sealant with minimum thickness of 1/4 inch (6 mm) along coating seams, rough cuts, and as recommended by manufacturer.
 4. Apply flashing to seal with adjacent construction and to bridge joints in coating substrate.
- H. Openings and Penetrations in Exterior Vapor Retarders:
1. Install flashing over sills, covering entire sill framing member, and extend at least 5 inches (127 mm) onto vapor retarder and at least 6 inches (152 mm) up jambs; mechanically fasten stretched edges.
 2. At openings 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 (100 mm) wide; do not seal sill flange.
 3. At openings with nonflanged frames, seal vapor retarder to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
 4. At head of openings, install flashing under vapor retarder extending at least 2 inches (50 mm) beyond face of jambs; seal vapor retarder to flashing.
 5. At interior face of openings, seal gaps between window/door frame 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 vapor retarder.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Owner's Inspection and Testing: Cooperate with Owner's testing agency.
 1. Allow access to work areas and staging.

2. Notify Owner's testing agency in writing of schedule for work of this section to allow sufficient time for testing and inspection.
 3. Do not cover work of this section until testing and inspection is accepted.
- C. Obtain approval of installation procedures from vapor retarder manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
 - D. Take digital photographs of each portion of installation prior to covering up vapor retarders.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 2700 - AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air barriers.

1.02 RELATED REQUIREMENTS

- A. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with air barriers.

1.03 DEFINITIONS

- A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.04 REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- E. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- F. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).
- G. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.05 SUBMITTALS

- A. See Section 01 3000 - 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 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

- A. (AIR BAR-3): Contractor's option to provide a self-adhesive or liquid applied membrane as described in the following paragraphs.
- B. Air Barrier Sheet, Self-Adhered (AIR BAR-3):
 - 1. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.

2. Water Vapor Permeance: 10 perms (572 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F (23 degrees C).
 3. Water Penetration Resistance Around Nails: Pass, when tested in accordance with ASTM D1970/D1970M (modified).
 4. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 180 days of weather exposure.
 5. 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.
 6. Comply with NFPA 285 requirements for wall assembly.
 7. Seam and Perimeter Tape: As recommended by sheet manufacturer.
 8. Basis of Design: Henry Company; Blueskin VP160: www.henry.com/#sle.
 9. Other Acceptable Products provided they meet or exceed the Basis of Design performance:
 - a. GCP Applied Technologies; Perm-A-Barrier VPS 30: www.gcpat.com/#sle.
 - b. VaproShield, LLC; WrapShield SA - Self-Adhered: www.vaproshield.com/#sle.
 - c. W. R. Meadows, Inc; Air-Shield SMP: www.wrmeadows.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- C. Air Barrier, Fluid Applied (AIR BAR-3): Vapor semi-permeable, elastomeric waterproofing.
1. Air Barrier Coating:
 - a. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.
 - b. Water Vapor Permeance: 11 perms (629 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F (23 degrees C).
 - c. Elongation: 250 percent, minimum, when tested in accordance with ASTM D412.
 - d. 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.
 - e. Comply with NFPA 285 requirements for wall assembly.
 - f. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
 - g. Basis of Design: Henry Company; Air-Bloc 17MR: www.henry.com/#sle.
 - h. Other Acceptable Products provided they meet or exceed the Basis of Design performance:
 - 1) GCP Applied Technologies; Perm-A-Barrier VPL 50RS UV Stable: www.gcpat.com/#sle.
 - 2) PROSOCO, Inc; R-GUARD Cat 5: www.prosoco.com/r-guard/#sle.
 - 3) W. R. Meadows, Inc; Air-Shield TMP: www.wrmeadows.com/#sle.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACCESSORIES

- A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.
- B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
 1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm), nominal thickness.
 2. All flashing materials shall be compatible with, and approved by, the membrane manufacturer.
 3. Comply with NFPA 285 requirements for wall assembly.
- C. Flexible Flashing: Self-adhering or mechanically-attached flashing used for wall penetrations in accordance with ICC-ES AC148 requirements.
- D. Thinners and Cleaners: As recommended by material manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and conditions are ready for work of this section.
- B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.
- C. Do not proceed with this work until unsatisfactory conditions have been corrected.

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. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.
- D. 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. Once sheets are in place, press firmly into 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 to adjacent substrates, and as flashing.
 - 5. At wide joints, provide extra flexible membrane allowing joint movement.
- E. Openings and Penetrations in Exterior Air Barriers:
 - 1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto air barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
 - 2. At openings 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 (100 mm) wide; do not seal sill flange.
 - 3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
 - 4. At head of openings, install flashing under air barrier extending at least 2 inches (50 mm) beyond face of jambs; seal air barrier to flashing.
 - 5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
 - 6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.

- B. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.
- C. Take digital photographs of each portion of installation prior to covering up air barriers.

3.05 PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 4213 - METAL WALL PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

1.02 RELATED REQUIREMENTS

- A. Section 05 4000 - Cold-Formed Metal Framing: Wall panel substrate.
- B. Section 07 2600 - Vapor Retarders: Vapor retarder under wall panels.
- C. Section 07 9200 - Joint Sealants: Sealing joints between metal wall panel system and adjacent construction.
- D. Section 09 2116 - Gypsum Board Assemblies: Wall panel substrate.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate dimensions, layout, joints, construction details, support clips, and methods of anchorage.
- C. Samples: Submit two samples of wall panel, 12 inches by 12 inches (305 mm by 305 mm) in size illustrating finish color, sheen, and texture.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in installing products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect panels from accelerated weathering by removing or venting sheet plastic shipping wrap.
- B. Store prefinished material off the ground and protected from weather; prevent twisting, bending, or abrasion; provide ventilation; slope metal sheets to ensure proper drainage.
- C. Prevent contact with materials that may cause discoloration or staining of products.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Finish Warranty: Provide 15-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.
- C. Special Warranty: Provide 2-year warranty covering water tightness and integrity of seals of metal wall panels. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Wall Panels - Concealed Fasteners:
 - 1. Bridger Steel: www.bridgersteel.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MANUFACTURED METALS

- A. Wall Panel System: Factory fabricated weathered metal panel system, site assembled.
 - 1. Provide exterior panels.
 - 2. Design and size components to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of wall.
 - 3. Design Pressure: In accordance with applicable codes.
 - 4. Maximum Allowable Deflection of Panel: $L/90$ for length(L) of span.
 - 5. Movement: Accommodate movement within system without damage to components or deterioration of seals, movement between system and perimeter components when subject to seasonal temperature cycling; dynamic loading and release of loads; and deflection of structural support framing.
 - 6. Drainage: Provide positive drainage to exterior for moisture entering or condensation occurring within panel system.
 - 7. Fabrication: Formed true to shape, accurate in size, square, and free from distortion or defects; pieces of longest practical lengths.
 - 8. Corners: Factory-fabricated in one continuous piece with minimum 18-inch (450 mm) returns.
- B. Weathering Steel Panels (WTHR STL-1):
 - 1. Basis of Design: 1" Tru-Snap Panel by Bridger Steel.
 - 2. Profile: Concealed fastener panel with floating clip system.
 - 3. Thickness: 22 gauge.
 - 4. Panel Width: 12-7/8 and 16-7/8 inch wide.
 - 5. Color: Truten A606 weathered steel.
- C. Soffit Panels (WTHR STL-2):
 - 1. Profile: Style as indicated, with venting not provided and 1/2 inch reveal.
- D. Internal and External Corners: Same material, thickness, and finish as exterior sheets; profile to suit system; shop cut and factory mitered to required angles.
- E. Trim: Same material, thickness and finish as exterior sheets; brake formed to required profiles.
- F. Anchors: Galvanized steel.

2.03 MATERIALS

- A. Precoated Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, Structural Steel (SS) or Forming Steel (FS), with G90/Z275 coating; continuous coil-coated on exposed surfaces with specified finish coating and on panel back with specified panel back coating.

2.04 ACCESSORIES

- A. Gaskets: Manufacturer's standard type suitable for use with system, permanently resilient.
- B. Fasteners: Manufacturer's standard type to suit application; with soft neoprene washers, steel, hot dip galvanized. Fastener cap same color as exterior panel.
- C. Bituminous Paint: Asphalt base.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify air barrier, see Section 07 2700, has been installed over wall panel substrate; see Section 05 4000.

3.02 INSTALLATION

- A. Install panels on walls in accordance with manufacturer's instructions.
- B. Protect surfaces in contact with cementitious materials and dissimilar metals with bituminous paint; allow to dry prior to wall panel installation.
- C. Fasten panels to structural supports; aligned, level, and plumb.
- D. Locate joints over supports.
- E. Provide expansion and control joints where indicated.
- F. Use concealed fasteners unless otherwise indicated by Architect.
- G. Seal and place gaskets to prevent weather penetration. Maintain neat appearance.

3.03 TOLERANCES

- A. Offset From True Alignment Between Adjacent Members Abutting or In Line: 1/16 inch (1.6 mm), maximum.
- B. Variation from Plane or Location As Indicated on Drawings: 1/4 inch (6.4 mm), maximum.

3.04 CLEANING

- A. Remove site cuttings from finish surfaces.
- B. Clean and wash prefinished surfaces with mild soap and water; rinse with clean water.

END OF SECTION

SECTION 07 5300 - ELASTOMERIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Elastomeric roofing membrane, adhered conventional application.
- B. Insulation, flat and tapered.
- C. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood cant strips.

1.03 REFERENCE STANDARDS

- A. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.
- B. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).
- C. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers; 2000 (Reapproved 2020).
- D. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2024.
- E. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015, with Editorial Revision (2022).
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- G. NRCA (WM) - The NRCA Waterproofing Manual; 2021.
- H. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, and fasteners.
- C. Shop Drawings: Indicate joint or termination detail conditions, conditions of interface with other materials, setting plan for tapered insulation, and paver layout.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- B. Store materials in weather protected environment, clear of ground and moisture.

- C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.
- D. Protect foam insulation from direct exposure to sunlight.

1.07 FIELD CONDITIONS

- A. Do not apply roofing membrane during unsuitable weather.
- B. Do not apply roofing membrane when ambient temperature is below 40 degrees F (5 degrees C) or above 100 degrees F (38 degrees C).
- C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.
- D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.
- E. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective work within a two year period after Date of Substantial Completion.
- C. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- D. Provide 20 year manufacturer's material and labor warranty to cover failure to prevent penetration of water.
- E. Provide manufacturer's standard 72 mph wind speed warranty.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 MANUFACTURERS

- A. EPDM Membrane Materials:
 - 1. Carlisle Roofing Systems, Inc: www.carlisle-syntec.com.
 - 2. Elevate: www.holcimelevate.com/#sle.
 - 3. GenFlex Roofing Systems, LLC: www.genflex.com.
 - 4. Johns Manville: www.jm.com.
 - 5. Mule-Hide Products Co, Inc: www.mulehide.com.
 - 6. Versico Roofing Systems: www.versico.com.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation:
 - 1. Dow Chemical Company: www.dow.com.
 - 2. GAF: www.gaf.com.
 - 3. Hunter Panels, LLC: www.hpanels.com.

4. Owens Corning Corporation: www.owenscorning.com.
5. ROCKWOOL: www.rockwool.com.
6. Insulation manufactured by the membrane manufacturer is approved.
7. Substitutions: See Section 01 6000 - Product Requirements.

2.03 ROOFING - UNBALLASTED APPLICATIONS

- A. Elastomeric Membrane Roofing (EPDM-2): One ply membrane, fully adhered, over insulation.
- B. Roofing Assembly Requirements:
 1. Roof Covering External Fire Resistance Classification: UL (DIR) certified Class A.
- C. Acceptable Insulation Types - Constant Thickness Application: Any of types specified.
 1. Minimum 2 layers of polyisocyanurate board.
- D. Acceptable Insulation Types - Tapered Application: Any of types specified.
 1. Tapered polyisocyanurate board.

2.04 ROOFING MEMBRANE AND ASSOCIATED MATERIALS

- A. Membrane: Ethylene-propylene-diene-monomer (EPDM); non-reinforced; complying with minimum properties of ASTM D4637/D4637M.
 1. Thickness: 0.060 inch (60 mil) (1.5 mm).
 2. Color: Black.
 3. Tensile Strength: 1,300 psi (9.0 MPa), measured in accordance with ASTM D412.
 4. Ultimate Elongation: 300 percent, minimum, measured in accordance with ASTM D412.
 5. Tear Strength: 150 lbf per inch (26.3 kN/m), measured in accordance with ASTM D624.
 6. Water Vapor Permeability: 0.5 perm inch (0.33 ng/(Pa s m)) maximum, measured in accordance with ASTM E96/E96M.
 7. Brittleness Temperature: -49 degrees F (-45 degrees C), measured in accordance with ASTM D746.
- B. Seaming Materials: As recommended by membrane manufacturer.
- C. Flexible Flashing Material: Same material as membrane.
 1. Thickness: 60 mil (1.5 mm).
 2. Color: Black.

2.05 INSULATION

- A. Insulation System Identification:
 1. (INSUL-50): Constant thickness polyisocyanurate insulation; minimum two staggered layers of equal thickness; provide tapered polyisocyanurate insulation as needed.
 2. (INSUL-51): Tapered polyisocyanurate insulation over constant thickness polyisocyanurate insulation; minimum two staggered layers of equal thickness; provide tapered insulation over entire roof as indicated in the drawings.
- B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, complying with ASTM C1289.
 1. Classifications:
 - a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
 - 1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of the core foam.
 - 2) Compressive Strength: Classes 1-2-3, Grade 2 - 20 psi (138 kPa), minimum.

- 3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inches (38 mm) thick; Class 1, Grades 1-2-3 - 8.4 (1.48) at 75 degrees F (24 degrees C).
2. Board Size: 48 by 96 inches (1220 by 2440 mm).
3. Tapered Board: Slope as indicated; minimum thickness 1/2 inch (12.7 mm); fabricate of fewest layers possible.
4. Board Edges: Square.

2.06 ACCESSORIES

- A. Cant and Edge Strips: Wood fiberboard, compatible with roofing materials ; cants formed to 45 degree angle.
- B. Membrane Adhesive: As recommended by membrane manufacturer.
- C. Surface Conditioner for Adhesives: Compatible with membrane and adhesives.
- D. Thinners and Cleaners: As recommended by adhesive manufacturer, compatible with membrane.
- E. Sealants: As recommended by membrane manufacturer.
- F. Walkway Pads (PAVER-2): Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
 1. Composition: Asphaltic with mineral granule surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify deck is supported and secure.
- C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.
- D. Verify deck surfaces are dry and free of snow or ice.
- E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 INSULATION - UNDER MEMBRANE

- A. Ensure vapor retarder is clean and dry, continuous, and ready for application of insulation.
- B. Attachment of Insulation: Contractors option to mechanically fasten, adhesively attach, or a combination of mechanical and adhesive attachment of roof insulation, provided all other roof system requirements are met including warranty requirements.
- C. Lay subsequent layers of insulation with joints staggered minimum 6 inches (152 mm) from joints of preceding layer.
- D. Place tapered insulation to the required slope pattern in accordance with manufacturer's instructions.
- E. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- F. At roof drains, use factory-tapered boards to slope down to roof drains over a distance of 18 inches (457 mm).
- G. Do not apply more insulation than can be covered with membrane in same day.

3.03 INSTALLATION - MEMBRANE

- A. Install elastomeric membrane roofing system in accordance with manufacturer's recommendations and NRCA (WM) applicable requirements.
- B. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

- C. Shingle joints on sloped substrate in direction of drainage.
- D. Fully Adhered Application: Apply adhesive to substrate at manufacturer's recommended rate. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.
- E. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches (76 mm). Seal permanently waterproof. Apply uniform bead of sealant to joint edge.
- F. At intersections with vertical surfaces:
 - 1. Extend membrane over cant strips and up a minimum of 4 inches (102 mm) onto vertical surfaces.
 - 2. Fully adhere flexible flashing over membrane and up to nailing strips.
- G. At gravel stops, extend membrane under gravel stop and to the outside face of the wall.
- H. Around roof penetrations, seal flanges and flashings with flexible flashing.
- I. Coordinate installation of roof drains and sumps and related flashings.

3.04 CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Remove bituminous markings from finished surfaces.
- C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.
- D. Repair or replace defaced or damaged finishes caused by work of this section.

3.05 PROTECTION

- A. Protect installed roofing and flashings from construction operations.
- B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fabricated sheet metal items.
- B. Sealants for joints within sheet metal fabrications.

1.02 REFERENCE STANDARDS

- A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- B. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2024).
- C. CDA A4050 - Copper in Architecture - Handbook; current edition.
- D. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.04 QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

1.05 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. Pre-Finished Aluminum (SMF-1): ASTM B209 (ASTM B209M); 0.032 inch (0.8 mm) thick; plain finish shop pre-coated with fluoropolymer coating.
 - 1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 2. Color: As selected by Architect from manufacturer's standard colors.
- B. Weathering Steel (SMF-2):
 - 1. Thickness: 22 gauge.
 - 2. Color: Truten A605 weathered steel.
 - 3. See Section 07 4213.
- C. Stainless Steel (SMF-3): ASTM A666, Type 304 alloy, soft temper, 28 gauge, (0.0156 inch) (0.40 mm) thick, smooth No. 4 - Brushed stainless steel.

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 (13 mm); 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 (450 mm) long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches (50 mm) over roofing gravel. Return and brake edges.

2.03 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.
- E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

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. Install surface mounted reglets true to lines and levels, and seal top of reglets with sealant.
- C. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil, 0.015 inch (0.38 mm).

3.03 INSTALLATION

- A. Insert flashings into reglets to form tight fit; secure in place with lead wedges; seal flashings into reglets with sealant.
- B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.
- C. Apply plastic cement compound between metal flashings and felt flashings.
- D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- E. Seal metal joints watertight.

END OF SECTION

SECTION 07 8400 - FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.
- D. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-Story Test Apparatus; 2025.
- E. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2023a.
- F. ITS (DIR) - Directory of Listed Products; current edition.
- G. FM (AG) - FM Approval Guide; Current Edition.
- H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- J. UL (DIR) - Online Certifications Directory; Current Edition.
- K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Certificate from authority having jurisdiction indicating approval of materials used.
- F. Manufacturer's qualification statement.
- G. Installer's qualification statement.

1.04 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 - 3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Verification of minimum three years documented experience installing work of this type.
- D. Firestop sealants upon curing, shall not re-emulsify, dissolve, leach, breakdown or otherwise be damaged over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic in a building's normal operating life.
- E. Firestop sealants selected shall be sufficiently flexible to accommodate motion such as pipe vibration, water-hammer, thermal expansion, and other normal building movement, without damage to the seal.
- F. One manufacturer shall supply all firestopping material to the extent possible.
- G. All firestop materials shall be installed prior to expiration of shelf life.

1.05 COORDINATION

- A. Schedule firestopping after installation of penetrants, but prior to concealing the openings.
- B. Firestopping shall precede gypsum board finishing.

1.06 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop.
 - 2. A/D Fire Protection Systems Inc: www.adfire.com.
 - 3. Hilti, Inc: www.us.hilti.com.
 - 4. Nelson FireStop Products: www.nelsonfirestop.com.
 - 5. Specified Technologies Inc: www.stfirestop.com.
 - 6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- C. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - 2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.

- B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
- D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
 - 4. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.04 FIRESTOPPING SYSTEMS

- A. Firestopping (FR STOP): Any material meeting requirements.
 - 1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 CONDITIONS REQUIRING FIRESTOPPING

- A. General: Provide firestopping for conditions specified whether or not firestopping is indicated, and if indicated, whether such materials designated as insulation, safing, or otherwise.
- B. Through-Penetration: Firestopping shall be installed in all open penetrations and in the annular space in all penetrations in any bearing or non-bearing fire-rated barrier.
- C. Membrane-Penetration: Where required by code, all membrane-penetrations in rated walls shall be protected with firestopping products that meet the requirements of third party time/temperature testing.
- D. Construction Joints/Gaps: Firestopping shall be provided at all fire rated walls as indicated on project drawings.
 - 1. Between the tops of walls and the underside of floors.
 - 2. In expansion joints at fire rated walls.
 - 3. In any penetration through fire rated wall, fill gaps and spaces with fire stopping material sufficient to maintain intended wall rating.
 - 4. Smoke-Stopping: As required by the other sections, smoke-stops shall be provided for through-penetrations, membrane-penetrations, and construction gaps with a material approved and tested for such application.

3.02 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.03 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing materials to prevent liquid material from leakage.

3.04 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.05 MARKING AND IDENTIFICATION

- A. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces;
 - 2. Be located within 15 feet (4572 mm) of the end of each wall and at intervals not exceeding 30 feet (9144 mm) measured horizontally along the wall or partition; and
 - 3. Include lettering not less than 3 inches (76 mm) in height with a minimum 3/8 inch (9.5 mm) stroke in a contrasting color incorporating the suggested wording. "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS" or other wording.

3.06 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.07 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- B. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.03 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
- B. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
- C. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- E. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).
- F. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015e1.

1.04 SUBMITTALS

- A. See Section 01 3000 - 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. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- D. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of experience.
- B. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.

2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver sufficient samples to manufacturer for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Nonsag Sealants:
 1. Bostik Inc: www.bostik-us.com.
 2. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html.
 3. Hilti, Inc: www.us.hilti.com.
 4. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
 5. Pecora Corporation: www.pecora.com.
 6. Sherwin-Williams Company: www.sherwin-williams.com.
 7. Sika Corporation: www.usa-sika.com.
 8. Specified Technologies Inc: www.stifirestop.com.
 9. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
 10. W.R. Meadows, Inc: www.wrmeadows.com.
 11. Substitutions: See Section 01 6000 - Product Requirements.
- B. Self-Leveling Sealants:
 1. Bostik Inc: www.bostik-us.com.
 2. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html.
 3. Pecora Corporation: www.pecora.com.
 4. Sherwin-Williams Company: www.sherwin-williams.com.
 5. Sika Corporation: www.usa-sika.com.
 6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
 7. W.R. Meadows, Inc: www.wrmeadows.com.
 8. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

- A. Scope:
 1. Exterior Joints:
 - a. Do not seal exterior joints unless indicated on drawings as sealed.
 - b. Seal open joints except open joints indicated on drawings as not sealed.
 2. Interior Joints:
 - a. Do not seal interior joints indicated on drawings as not sealed.
 - b. Do not seal gaps and openings in gypsum board and suspended ceilings
 - c. Do not seal through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - d. Seal open joints except specific open joints indicated on drawings as not sealed.
 3. Do Not Seal:
 - a. Intentional weep holes in masonry.
 - b. Joints indicated to be covered with expansion joint cover assemblies.
 - c. Joints where sealant is specified to be furnished and installed by manufacturer of product to be sealed.

- d. Joints where sealant installation is specified in other sections.
 - e. Joints between suspended ceilings and walls.
- B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
 - 1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
- C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 1. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
 - 2. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
 - 3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 - 4. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
 - 5. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
 - 6. Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.
- D. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

2.03 JOINT SEALANTS - GENERAL

- A. Material ID's:
 - 1. (SEALANT-1): Joint sealant or caulking with or without backer rod. Type as indicated above.

2.04 NONSAG JOINT SEALANTS

- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Color: To be selected by Architect from manufacturer's standard range.
 - 2. Cure Type: Multi-component, neutral curing.
 - 3. Service Temperature Range: Minus 20 to 180 degrees F (Minus 29 to 82 degrees C).
- B. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, nonstaining, nonbleeding, non-sagging; not intended for exterior use.
 - 1. Color: To be selected by Architect from manufacturer's standard range.
 - 2. Grade: ASTM C834; Grade 0 Degrees F (Minus 18 Degrees C).

2.05 SELF-LEVELING JOINT SEALANTS

- A. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
 - 1. Composition: Multicomponent, 100 percent solids by weight.
 - 2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
 - 3. Color: To be selected by Architect from manufacturer's standard colors.
 - 4. Joint Width, Minimum: 1/8 inch (3 mm).
 - 5. Joint Width, Maximum: 1/4 inch (6 mm).
 - 6. Joint Depth: Provide product suitable for joints from 1/8 inch (3 mm) to 2 inches (51 mm) in depth including space for backer rod.

2.06 ACCESSORIES

- A. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

- B. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- 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.
- C. Verify that backer rods are of the correct size.

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.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in an inconspicuous area to verify that it does not stain or discolor slab.

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. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- D. Install bond breaker backing tape where backer rod cannot be used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- H. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

END OF SECTION

SECTION 07 9513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Expansion joint cover assemblies for floor, wall, ceiling, and soffit surfaces.

1.02 RELATED REQUIREMENTS

- A. Section 09 2116 - Gypsum Board Assemblies: Gypsum board control joint trim.

1.03 REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- D. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Expansion Joint Cover Assemblies:
 - 1. Construction Specialties, Inc: www.c-sgroup.com.
 - 2. Inpro: www.inprocorp.com.
 - 3. MM Systems Corp: www.mmsystemscorp.com.
 - 4. Nystrom, Inc: www.nystrom.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLIES

- A. Expansion Joint Cover Assemblies - General (EXP JT-1): Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 - 1. Joint Dimensions and Configurations: As indicated on drawings.
 - 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 - 3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

2.03 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
- B. Threaded Fasteners: Aluminum.
- C. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

3.02 INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

- A. Do not permit traffic over unprotected floor joint surfaces.

END OF SECTION

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
- C. Section 09 9113 - Exterior Painting: Field painting.
- D. Section 09 9123 - 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 A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- G. 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.
- H. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.
- I. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- J. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.
- K. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- L. ITS (DIR) - Directory of Listed Products; Current Edition.
- M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.
- O. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.
- P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.

- S. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.
- T. UL (DIR) - Online Certifications Directory; Current Edition.
- U. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.06 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 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Basis of Design: Steelcraft, an Allegion brand: www.allegion.com.
 - 2. Other Acceptable Manufactures provided they meet or exceed the Basis of Design performance requirements:
 - a. Ceco Door or Curries, an Assa Abloy Group company: www.assaabloydss.com.
 - b. Republic Doors, an Allegion brand: www.republicdoor.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized 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. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturer's standard.
7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - a. Provide minimum 3/16" plate steel as reinforcement for hardware. If the manufacturer's standard is for a greater thickness at specific locations, provide the thicker of the two standards.
8. Electrified Hardware Preparation:
 - a. Provide electrical conduit and junction-boxes as required for electric power and signal routing and for electrical terminations as required to support electrical and electronic hardware indicated in Section 08 7100.
 - b. Secure conduit and boxes to the frame and doors. Extend conduit attached to frames 12 inches above frame for connection to conduit furnished by other sections.
 - c. Coordinate locations of conduit and boxes with Section 08 7100.
9. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.
- 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.

2.04 HOLLOW METAL DOORS

- A. Exterior Doors: Thermally insulated.
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
 - e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
 2. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
 3. Door Finish: Factory primed and field finished.
- B. Interior Doors, Non-Fire Rated:
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
- C. Fire-Rated Doors:
 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
 2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
 - a. Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - b. Attach fire rating label to each fire rated unit.
 3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
 4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

2.05 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
 1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
 2. Frame Metal Thickness: 14 gauge, 0.067 inch (1.7 mm), minimum.
 3. Weatherstripping: Separate, see Section 08 7100.
- D. Interior Door Frames, Non-Fire Rated: Face welded type.
 1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum; except 14 gage, 0.067 inch (1.7 mm) for masonry applications.
- E. Door Frames, Fire-Rated: Face welded type.
 1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum; except 14 gage, 0.067 inch (1.7 mm) for masonry applications.
- F. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- G. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.
- H. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- I. Frames Wider than 48 inches (1219 mm): Reinforce with steel channel fitted tightly into frame head, flush with top.

2.06 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.07 ACCESSORIES

- A. Glazing: As specified in Section 08 8000.

- B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches (102 mm) as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- C. 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.
- D. 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 PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.03 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. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 7100.
- F. Comply with glazing installation requirements of Section 08 8000.
- G. Coordinate installation of electrical connections to electrical hardware items.

3.04 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

3.05 ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.02 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames.
- B. Section 08 7100 - Door Hardware.
- C. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

- A. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Samples: Submit two samples of door veneer, 6 x 6 inch (152 x 152 mm) in size illustrating wood grain, stain color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.
- F. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Basis of Design: Forte Opening Solutions; Aspiro Select Wood Veneer Doors: www.forteopenings.com.

2.03 DOORS

- A. Doors: See drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
 - 3. Wood veneer facing with factory transparent finish, as indicated on drawings.

2.04 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.05 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: White , veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Same species as face veneer.
 - 2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet (3 m) of each other when doors are closed.

2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Provide sustainably harvested wood, sourced or labeled as specified in Section 01 6000.
- C. Provide composite wood containing no added formaldehyde. See Section 01 6116.
- D. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- E. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.

- F. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- G. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- H. Provide edge clearances in accordance with the quality standard specified.

2.07 FINISHES - WOOD VENEER DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS), Section 5 - Finishing for grade specified and as follows:
 - 1. Transparent:
 - a. System - 9 UV Curable Acrylated Epoxy Polyester or Urethane.
 - b. Stain: Caramel; as selected by Architect.
 - c. Sheen: Satin.
- B. Seal door top edge with color sealer to match door facing.

2.08 ACCESSORIES

- A. Glazing: See Section 08 8000.
- B. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style tamper proof screws.
- C. Door Hardware: See Section 08 7100.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

END OF SECTION

SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Field paint finish.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Panel Material: Steel.
 - 2. Size: 24 inch by 24 inch (609 mm by 609 mm).
 - 3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 4. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
 - 5. Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.
- B. Ceiling-Mounted Units:
 - 1. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
 - 2. Size - Other Ceilings: 24 inch by 24 inch (609 mm by 609 mm).
 - 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.
 - 2. Babcock-Davis: www.babcockdavis.com.
 - 3. Cendrex, Inc: www.cendrex.com.
 - 4. Karp Associates, Inc: www.karpinc.com.
 - 5. Nystrom, Inc; HVAC - Access Doors: www.nystrom.com/#sle.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Door and Frameless Units (ACC PNL-1): Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
 - 1. Style: Exposed frame with door surface flush with frame surface.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
 - 2. Door Style: Single thickness with rolled or turned in edges.

3. Frames: 16-gauge, 0.0598-inch (1.52 mm) minimum thickness.
4. Single Steel Sheet Door Panels: 16-gauge, 0.0625-inch (1.6 mm) minimum thickness.
5. Steel Finish: Primed.
6. Size: As scheduled above unless otherwise indicated in the drawings.
7. Hardware:
 - a. Hinges for Non-Fire-Rated Units: Continuous piano hinge.
 - b. Latch/Lock: Screw driver slot for quarter turn cam latch.

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.

END OF SECTION

SECTION 08 4313 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.
- B. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- F. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- I. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- J. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).
- K. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
- L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.
- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- E. Energy Performance Certification: For each aluminum framed storefront system and glazing combination provide NFRC CMAST Bid Report. Coordinate with Section 08 8000.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components 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. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

- A. Center-Set Style, Thermally-Broken:
 - 1. 2 inch by 4-1/2 inch, nominal frame profile.
 - a. Basis of Design: Tubelite Inc; 14000 I/O Series Storefront; www.tubeliteinc.com.
 - b. Other Acceptable Manufactures provided they meet or exceed the Basis of Design performance requirements:
 - 1) EFCO Corporation; www.efcocorp.com.
 - 2) Kawneer Company, Inc; www.kawneer.com.
 - 3) Oldcastle Building Envelope; www.obe.com.
 - 4) YKK AP America Inc; www.ykkap.com.

2.02 BASIS OF DESIGN -- FRAMING FOR MONOLITHIC GLAZING

- A. Center-Set Style, Not Thermally-Broken:

1. 2 inch by 4-1/2 inch, nominal frame profile.
 - a. Basis of Design: Kawneer Company, Inc; Trifab VersaGlaze 451; www.kawneer.com.
 - b. Other Acceptable Manufactures provided they meet or exceed the Basis of Design performance requirements:
 - 1) EFCO Corporation; Series 402; www.efcocorp.com.
 - 2) Oldcastle Building Envelope; FG-3000; obe.com.
 - 3) Tubelite Inc; E14000 Series; www.tubeliteinc.com.
 - 4) YKK AP America Inc; YES 45 FI; www.ykkap.com.

2.03 BASIS OF DESIGN -- SWINGING DOORS

- A. Wide Stile, Not Thermally-Broken:
 1. Basis of Design: Kawneer Company, Inc; 500 Heavy Wall Entrances; www.kawneer.com.
 2. Other Acceptable Manufactures provided they meet or exceed the Basis of Design performance requirements:
 - a. EFCO Corporation; Series D518 DuraStile; www.efcocorp.com.
 - b. Oldcastle Building Envelope; Rugged Entrance Wide Stile Door and Frame; obe.com.
 - c. Tubelite Inc; Monumental Doors; www.tubeliteinc.com.
 - d. YKK AP America Inc; 50M Monumental Commercial Entrances; www.ykkap.com.
- B. Wide Stile, Insulating Glazing, Thermally-Broken:
 1. Basis of Design: Kawneer Company, Inc; 560 Insulclad Thermal Entrances; www.kawneer.com.
 2. Other Acceptable Manufactures provided they meet or exceed the Basis of Design performance requirements:
 - a. EFCO Corporation; Series D502 ThermaStile; www.efcocorp.com.
 - b. Oldcastle Building Envelope; WS-500TC Thermal Composite Door & Frame Entrances; obe.com.
 - c. Tubelite Inc; Therml=Block Entrances; www.tubeliteinc.com.
 - d. YKK AP America Inc; MegaTherm 50T Thermally Broken Entrance Systems; www.ykkap.com.

2.04 ALUMINUM-FRAMED STOREFRONT

- A. Aluminum-Framed Storefront (ALSTOR-1): Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 1. Glazing Rabbet: For 1 inch (25 mm) insulating glazing.
 2. Finish Color: Dark bronze.
 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.

8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
- B. Performance Requirements
1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of applicable code.
 - b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
 2. Water Penetration Resistance: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 10 psf (480 Pa).
 3. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.
 4. Condensation Resistance Factor of Framing: 60, minimum, measured in accordance with AAMA 1503.
 5. Overall U-value Including Glazing: 0.34 Btu/(hr sq ft deg F), maximum.

2.05 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
1. Framing members for interior applications need not be thermally broken.
 2. Glazing Stops: Flush.
 3. Cross-Section: As indicated on drawings.
 4. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
- B. Glazing: See Section 08 8000.
- C. Swing Doors: Glazed aluminum.
1. Top Rail: 5 inches (127 mm) wide, nominal.
 2. Vertical Stiles: 5 inches (127 mm) wide, nominal.
 3. Bottom Rail: 10 inches (254 mm) wide.
 4. Glazing Stops: Square.
 5. Finish: Same as storefront.

2.06 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- C. Fasteners: Stainless steel.
- D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch (0.81 mm) minimum thickness; finish to match framing members.
- E. Concealed Flashings: Stainless steel, 26 gauge, 0.0187 inch (0.48 mm) minimum thickness.
- F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- G. Sealant for Setting Thresholds: Non-curing butyl type.

- H. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- I. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.07 FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils (0.018 mm) thick.

2.08 HARDWARE

- A. For each door, include weatherstripping.
- B. Other Door Hardware: See Section 08 7100.
- C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.
- D. Automatic Door Operators and Actuators: See Section 08 4229.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install glass and infill panels using glazing method required to achieve performance criteria; see Section 08 8000.
- J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for general testing and inspection requirements.
- B. Repair or replace storefront components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

- A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 4413 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Aluminum-framed curtain wall, with vision glazing and glass infill panels.

1.02 RELATED REQUIREMENTS

- A. Section 07 2600 - Vapor Retarders: Sealing framing to water-resistive barrier installed on adjacent construction.
- B. Section 08 8000 - Glazing.

1.03 REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.
- B. AAMA 501.4 - Recommended Static Test Method for Evaluating Window Wall, Curtain Wall and Storefront Systems Subjected to Seismic and Wind-Induced Inter-Story Drift; 2018.
- C. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- F. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- I. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- L. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- M. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
- N. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, internal drainage details, glazing, and infill.

- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.
- D. Samples: Submit two samples 2 x 4 inches (51 x 102 mm) in size illustrating finished aluminum surface, glazing, infill panels, and glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics and engineering calculations, and identify dimensional limitations; include load calculations at points of attachment to building structure.
- G. Energy Performance Certification: For each glazed aluminum curtain wall system and glazing combination provide NFRC CMAST Bid Report. Coordinate with Section 08 8000.
- H. Test Reports: Submit results of full-size mock-up testing. Reports of tests previously performed on the same design are acceptable.
- I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Designer Qualifications: Design curtain wall and its structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F (5 degrees C). Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 5-year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units. Complete forms in Owner's name and register with installer.
- C. Finish Warranty: Provide 5-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 BASIS OF DESIGN - CURTAIN WALL SYSTEMS

- A. Pressure Cap Four Sides; Not Unitized, Field Assembled:
 - 1. Basis of Design: 400T Series, 2-1/2 inch (65 mm) wide face: www.tubeliteinc.com.
 - 2. Other Acceptable Manufactures provided they meet or exceed the Basis of Design performance requirements:
 - a. Boyd Aluminum; Series B2500, 2-1/2-inch (64 mm) wide face, Outside Glazed Curtain Wall: www.boydaluminum.com.
 - b. EFCO, a Pella Company; System 5600 Duracast, 2-1/2 inch (63.5 mm) wide face: www.efcocorp.com.
 - c. Kawneer Company, Inc; 1600UT Series Wall System 1, 2-1/2 inch (65 mm) wide face.
 - d. Oldcastle Building Envelope: Reliance TC Type II, 2-1/2 inch (65 mm) wide face: www.obe.com.
 - e. YKK AP America, Inc: YCW 750 XT, 2-1/2 inch (65 mm) wide face: www.ykkap.com.

2.03 CURTAIN WALL

- A. Aluminum-Framed Curtain Wall: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Outside glazed, with pressure plate and mullion cover.
 - 2. Finish: Class I color anodized; Dark Bronze.
 - a. Factory finish surfaces that will be exposed in completed assemblies.
 - b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 - 3. Provide flush joints and corners, weathersealed, accurately fitted and secured; prepared to receive anchors; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 6. Maintain continuous air barrier and/or vapor retarder seal throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
 - 7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
- B. Structural Performance Requirements: Design and size components to withstand the following load requirements without damage or permanent set.
 - 1. Design Wind Loads: Comply with the requirements of ASCE 7

- a. Member Deflection: For spans less than 13 feet 6 inches (4115 mm), limit member deflection to flexure limit of glass in any direction, and maximum of 1/175 of span or 3/4 inch (19 mm), whichever is less and with full recovery of glazing materials.
 - b. Member Deflection: For spans over 13 feet 6 inches (4115 mm) and less than 40 feet (12.2 m), limit member deflection to flexure limit of glass in any direction, and maximum of 1/240 of span plus 1/4 inch (1/240 of span plus 6.4 mm), with full recovery of glazing materials.
- 2. Interstory Differential Lateral Movement: Meeting pass/fail criteria of AAMA 501.4 for Use Group I, Standard Occupancy, when tested at design displacement of 0.010 times greater adjacent story height, maximum, and 1.5 times design displacement, through three complete cycles.
- 3. Movement: Accommodate the following movement without damage to components or deterioration of seals:
 - a. Expansion and contraction caused by 180 degrees F (82 degrees C) surface temperature.
 - b. Expansion and contraction caused by cycling temperature range of 170 degrees F (77 degrees C) over a 12 hour period.
 - c. Movement of curtain wall relative to perimeter framing.
 - d. Deflection of structural support framing, under permanent and dynamic loads.
- C. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on indoor face when tested as follows:
 - 1. Test Pressure Differential: 10 psf (480 Pa).
 - 2. Test Method: ASTM E331.
- D. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of wall area when tested in accordance with ASTM E283/E283M at 6.24 psf (300 Pa) pressure difference across assembly.
- E. Thermal Performance Requirements:
 - 1. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
 - 2. Overall U-value Including Glazing: 0.36 Btu/(hr sq ft deg F), maximum.

2.04 COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 - 1. Framing members for interior applications need not be thermally broken.
 - 2. Cross-Section: As indicated on drawings.
 - 3. Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.
- B. Glazing: See Section 08 8000.
- C. Sill Plate: Provide a subsill plate with integral front lip. Match finish of curtain wall system.

2.05 MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209/B209M.
- C. Structural Steel Sections: ASTM A36/A36M; galvanized in accordance with requirements of ASTM A123/A123M.
- D. Fasteners: Stainless steel; type as required or recommended by curtain wall manufacturer.
- E. Exposed Flashings: Aluminum sheet, 20-gauge, 0.032-inch (0.81 mm) minimum thickness; finish to match framing members.
- F. Concealed Flashings: Sheet aluminum, 26-gauge, 0.017-inch (0.43 mm) minimum thickness.

- G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- H. Glazing Accessories: See Section 08 8000.
- I. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils (0.018 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other related work.
- B. Verify that curtain wall openings and adjoining water-resistive and air barrier seal materials are ready to receive work of this section.
- C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

- A. Install curtain wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Pressure Plate Framing: Install glazing and infill panels using exterior dry glazing method; see Section 08 8000.
- H. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm/m) noncumulative or 0.5 inches per 100 feet (12 mm/30 m), whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).
- C. Sealant Space Between Curtain Wall Mullions and Adjacent Construction: Maximum of 3/4 inch (19 mm) and minimum of 1/4 inch (6 mm).

3.04 FIELD QUALITY CONTROL

- A. Provide services of curtain wall manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 01 4000 - Quality Requirements for general testing and inspection requirements.
- C. Repair or replace curtain wall components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 ADJUSTING

- A. Adjust operating hardware for smooth operation.

3.06 CLEANING

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, take care to remove dirt from corners, and wipe surfaces clean.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

END OF SECTION

SECTION 08 5653 - SECURITY WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Security transaction windows.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- D. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Security Transaction Windows:
 - 1. C.R. Laurence Co, Inc: www.crlaurence.com.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SECURITY TRANSACTION WINDOWS

- A. Security Transaction Windows: Aluminum 6063-T5 extruded aluminum lined with U.L. listed bullet resistant fiberglass for level 3.
 - 1. Basis of Design: Interior Aluminum Bullet Resistant Sliding Transaction Window by C.R. Laurence Co, Inc.
 - 2. Frame nominal width: 4 inch.
 - 3. Finish: Satin Clear Anodized.
 - 4. Location: Built within interior wall, as indicated on drawings.
 - 5. Type of Use: As indicated on drawings.
 - 6. Ballistic Resistance: Tested to meet UL 752, Level 3.
 - 7. Glazing: Single (monolithic), clear, and ballistic resistant, level 3 in accordance with U.L. 752 testing standards. 1-1/4 inch laminated polycarbonate with abrasion resistant coating.

2.03 ASSEMBLY COMPONENTS

- A. Glazing Seals: Factory installed; molded EPDM or neoprene compressible gaskets and compression strips.
- B. Shelf: 2 inches thick, full window width, 12 inch minimum depth.
- C. Deal Trays: Formed stainless steel, recessed into counter or sill for mounting under glazing frame, non-ricochet, Level 3 Bullet Resistant.
 - 1. Basis of Design: Model BRT312 Deal Tray, C.R. Laurence Co, Inc.

2. Finish: Brushed Stainless Steel.
3. Style: Ricochet-resistant, with recessed bullet trap on secure side, with sliding cover.
4. Size: 12 inches wide x 12 inches depth x 2 inches high Drop-In Deal Tray.

2.04 INSTALLATION

- A. Install frames and glazing in accordance with manufacturer's printed instructions and recommendations. Repair damaged units as directed.

2.05 FINISHES

- A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that window openings are ready for installation of windows.
- B. Notify Architect if conditions are not suitable for installation of windows; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions and drawing details.
- B. Install windows in correct orientation (inside/outside or secure/non-secure).
- C. Anchor windows securely in manner so as to achieve performance specified.
- D. Set sill members and sill flashing in continuous bead of sealant.

3.03 ADJUSTING

- A. Adjust operating components for smooth operation while also providing tight fit at contact points and a secure enclosure; lubricate operating hardware.

3.04 CLEANING

- A. Clean exposed surfaces promptly after installation without damaging finishes.
- B. Remove and replace defective work.

END OF SECTION

SECTION 08 6200 - UNIT SKYLIGHTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Skylights with integral frame.

1.02 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.
- B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.
- C. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Include structural, thermal, and daylighting performance values.
- C. Shop Drawings: Indicate configurations, dimensions, locations, fastening methods, and installation details.
- D. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:
 - 1. Evidence of AAMA Certification.
 - 2. Evidence of WDMA Certification.
 - 3. Evidence of CSA Certification.
 - 4. Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

1.04 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide five-year manufacturer warranty including coverage for leakage due to defective skylight materials or construction. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Unit Skylights:
 - 1. Kingspan Light + Air, LLC: www.kingspanlightandair.us.
 - 2. Wasco Skylights - Part of the VELUX Group: www.wascoskylights.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 SKYLIGHTS

- A. Unit Skylights (SKYLIGHT-1): Factory-assembled glazing in aluminum frame, free of visual distortion, and weathertight.
 - 1. Basis of Design: Wasco EcoSky; Model Number CLD3-3636.
 - 2. Shape: Square dome.
 - 3. Glazing: Double.

4. Operation: None; fixed.
5. Nominal Size: 36 x 36 inches (915 x 915 mm).

2.03 PERFORMANCE REQUIREMENTS

- A. Provide unit skylights that comply with the following:
 1. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific skylight type:
 2. Allow for expansion and contraction within system components caused by a cycling surface temperature range of 170 degrees F (95 degrees C) without causing detrimental effects to system or components.

2.04 COMPONENTS

- A. Double Glazing: Acrylic plastic; factory sealed.
 1. Outer Glazing: Clear transparent.
 2. Inner Glazing: Clear transparent.

2.05 ACCESSORIES

- A. Anchorage Devices: Type recommended by manufacturer, exposed to view.
- B. Counterflashings: Same metal type and finish as skylight frame.
- C. Protective Back Coating: Zinc molybdate alkyl.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that openings and substrate conditions are ready to receive work of this section.

3.02 PREPARATION

- A. Apply protective back coating on aluminum surfaces of skylight units that will be in contact with cementitious materials or dissimilar metals.

3.03 INSTALLATION

- A. Install unit skylights in accordance with manufacturer's instructions and ASTM E2112.
- B. Install skylight units and mount securely to curb assembly; install counterflashing as required.
- C. Apply sealant to achieve watertight assembly.

3.04 CLEANING

- A. Upon completion of installation, thoroughly clean skylight aluminum surfaces in accordance with AAMA 609 & 610.
- B. Remove protective material from prefinished aluminum surfaces.
- C. Wash down exposed surfaces; wipe surfaces clean.
- D. Remove excess sealant.

END OF SECTION

SECTION 08 7100 - DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood, aluminum, and hollow metal doors.
- B. Electrically operated and controlled hardware.
- C. Thresholds.
- D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames.
- B. Section 08 1416 - Flush Wood Doors.
- C. Section 08 7113 - Power Door Operators.

1.03 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA - Builders Hardware Manufacturers Association.
- C. DHI (H&S) - Sequence and Format for the Hardware Schedule; 2019.
- D. DHI (KSN) - Keying Systems and Nomenclature; 2019.
- E. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.
- F. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- H. ITS (DIR) - Directory of Listed Products; Current Edition.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025.
- K. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.
- M. UL (DIR) - Online Certifications Directory; Current Edition.
- N. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
 - 1. Architect.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.

- C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- D. After receipt of approved hardware schedule, Hardware supplier shall initiate a meeting including the owner's representative to determine keying requirements. Upon completion of the initial key meeting, hardware supplier shall prepare a proposed key schedule with symbols and abbreviations as set forth in the door and hardware institute's publication "Keying Procedures, Systems, and Nomenclature".
Submit copies of owner approved key schedule for review and field use in quantities as required by Division 01 - General Conditions. Wiring diagrams shall be included in final submittals transmitted for distribution and field use.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 - a. Submit in vertical format.
 - 3. List groups and suffixes in proper sequence.
 - 4. Provide complete description for each door listed.
 - 5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 - 6. Include account of abbreviations and symbols used in schedule.
- D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 - 2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 - 3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - 1. Submit manufacturer's parts lists and templates.
 - 2. Bitting List: List of combinations as furnished.
- F. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Manufacturers and model numbers listed are to establish a standard of function and quality. Similar items by approved manufacturers that are equal in design, function, and quality, may be considered for prior approval of the architect, provided the required data and physical samples are submitted for approval as set forth in Division 01 - General Requirements.
- C. Obtain each type of hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
- D. Electrical drawings and electrical specifications are based on the specific electrified hardware components specified in hardware sets. When electronic hardware components other than those indicated in hardware sets are provided, the supplier shall be responsible for all costs incurred by the design team and their consultants to review, and revise electrical drawings and electrical specifications. Supplier shall also be responsible for any additional costs associated with required changes in related equipment, materials, installation, or final hook up to insure the system will operate and function as indicated in the construction documents, including hardware set operational / functional descriptions.
- E. All hardware items shall be manufactured no earlier than 6 months prior to delivery to site.
- F. Hardware supplier shall be factory trained and certified by the manufacturer to provide and support all computer managed locks and system components.
- G. Hardware supplier shall participate when reasonably requested to meet with the contractor and or architect to inspect any claim for incorrect or non-functioning materials; following such inspection, the hardware supplier shall provide a written statement documenting the cause and proposed remedy of any unresolved items.
- H. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- I. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

- A. See Section 01 7800 - 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: Ten 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 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.
 - 3. Applicable provisions of NFPA 101.
 - 4. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
 - 5. Hardware for Smoke and Draft Control Doors: Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
 - 6. Listed and certified compliant with specified standards by BHMA (CPD).
 - 7. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 - 8. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 - 9. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.
- D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
- E. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 - 2. Fire-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.
 - 3. Concealed Fasteners: Do not use through or sex bolt type fasteners on door panel sides indicated as concealed fastener locations, unless otherwise indicated.

2.02 MANUFACTURERS

- A. Provide manufacturers, products, and product lines listed within this Section and as indicated in Section 08 7105 - Hardware Groups.
- B. Substitutions: See Section 01 6000 - Product Requirements.

2.03 HINGES

- A. Acceptable manufacturers and respective catalog numbers:
 - 1. Butt Hinges
 - a. Standard Weight, Ball Bearing, Non-Ferrous:
 - 1) Ives: 5BB1
 - 2) Stanley: FBB191
 - 3) Hager: BB1191
 - 4) McKinney: TB2314
 - b. Heavy Weight, Ball Bearing:
 - 1) Ives: 5BB1HW

- 2) Stanley: FBB168
 - 3) Hager: BB1168
 - 4) McKinney: T4B3786
- c. Heavy Weight, Ball Bearing, Non-Ferrous:
 - 1) Ives: 5BB1HW
 - 2) Stanley: FBB199
 - 3) Hager: BB1199
 - 4) McKinney: T4B3386
- 2. Self Closing Hinges:
 - a. (0.134) Steel:
 - 1) Bommer: LB4310
 - 2) Hager: 1250
 - 3) McKinney: 1502
 - 4) Stanley: 2060R
 - 5) Ives: 3SP1
 - 6) PBB: RS81
 - b. (0.134) Stainless Steel:
 - 1) Bommer: LB4390
 - 2) Hager: 1150
 - 3) McKinney: 1552
 - 4) Stanley: 2060R
 - 5) Ives: 3SP1
 - 6) PBB: BB81
- 3. Continuous Hinges:
 - a. Edge Mount Pin & Barrel Stainless Steel:
 - 1) Ives: 700 Series
 - 2) Markar: 300 Series
 - 3) Stanley: 650 Series
 - 4) McKinney: 300 Series
- 4. Power Transfers:
 - a. Concealed Ten-Wire:
 - 1) Von Duprin: EPT-10
 - 2) ASSA: CEPT-10
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 - 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - a. Provide hinge width required to clear surrounding trim.
 - 2. Continuous Hinges: Comply with BHMA A156.26.
 - a. Continuous hinges shall be full height pin and barrel type hinge providing full height door support up to 600 lbs. Edge mount (unless noted otherwise).
 - b. Construct hinges of heavy-duty 14-gauge material. The stainless internal pin shall have a diameter of 0.25 and the exterior barrel diameter of 0.438.
 - c. Hinge shall be non-handed with symmetrical template hole pattern and factory drilled.
Hinge must accept a minimum of 21 fasteners on the door and 21 fasteners on the frame.
 - d. Each knuckle to be 2 inch, including split nylon bearing at each separation for quiet, smooth, self-lubricating operation.

- e. Hinge to be able to carry Warnock Hersey Int. or UL for fire rated doors and frames up to 3 hours.
- f. Provide machine screws for doors which have been reinforced to accept machine screws.
- g. Note: Fire label for doors and frames should be placed on the header and top rail of fire rated doors and frames.
- 3. Provide hinges on every swinging door.
- 4. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
- 5. Provide non-removable pins on exterior outswinging doors.
- 6. Provide power transfer hinges where electrified hardware is mounted in door leaf.
 - a. Concealed power transfers shall be concealed in the door and frame when the door is closed.
 - b. Concealed power transfers shall have a steel tube to protect wires from being cut.
 - c. Concealed power transfers with spring tubes shall be rejected.
 - d. Concealed power transfers shall be supplied with a mud box to house all terminations.
- 7. Unless otherwise specified, furnish hinges for exterior doors, fabricated from brass, bronze, or stainless steel. Unless otherwise specified, hinges for interior doors may be fabricated from steel.
- 8. Unless otherwise specified, furnish hinges in the following sizes:
 - a. 4-1/2" x 4-1/2" 1-3/4" thick doors
- 9. Furnish hinges with sufficient width to accommodate trim and allow for 180-degree swing.
- 10. Unless otherwise specified, furnish hinges with flat button tips with non-rising pins at interior doors, non-removable loose pins (NRP) at exterior and out-swinging interior doors.
- 11. Unless otherwise specified, furnish all hinges to template standards.
- 12. Unless otherwise specified, furnish hinge weight and type as follows:
 - a. Standard weight: ball bearing hinge 5BB1 for interior opening 40 inches wide.
 - b. Heavyweight: 4 ball bearing hinge 5BB1HW for interior openings over 40 inches wide, and for all vestibule doors.
 - c. Heavyweight: 4 ball bearing hinge 5BB1HWss for exterior openings unless otherwise listed in groups.
- 13. Provide following quantity of butt hinges for each door:
 - a. Doors up to 60 inches (1.5 m) High: Two hinges.
 - b. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
 - c. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.
 - d. Doors over 42 inches wide: One additional hinge.

2.04 FLUSH BOLTS

A. Acceptable manufacturers and respective catalog numbers:

- 1. Dust Proof Strike:
 - a. Ives: DP2
 - b. Door Controls: 80
 - c. Hager: 280X
 - d. Rockwood: 570
- 2. Constant Latch Flush Bolt:
 - a. Ives: FB51P/FB61P
 - b. Door Controls: 805/905
 - c. Hager: 293D/294D
 - d. Rockwood: 2849/2949
- 3. Automatic Flush Bolt:

- a. Ives: FB31P/FB41P
 - b. Door Controls: 842/942
 - c. Hager: 291D/292D
 - d. Rockwood: 2842/2942
- 4. Manual Flush Bolt:
 - a. Ives: FB548
 - b. Door Controls: 780
 - c. Hager: 282D
 - d. Rockwood: 555
- B. Flush Bolts: Comply with BHMA A156.16, Grade 1.
 - 1. Flush Bolt Throw: 3/4 inch (19 mm), minimum.
 - 2. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
 - 3. Unless otherwise specified, provide 12" rods for manual flush bolts for door 7'-6" or less, 24" top rods for doors over 7'-6" to 8'-6".
 - 4. Self-Latching Flush Bolts: Automatically latch upon closing of door; manually retracted; located on inactive leaf of pair of doors.
 - 5. All flush-bolt applications shall be UL listed to be installed with top flush-bolt only. Provide auxiliary fire bolt as required for fire rated openings where less bottom bolt has been specified.

2.05 EXIT DEVICES

- A. Acceptable manufacturers and respective catalog numbers:
 - 1. Wide Stile, Push Pad:
 - a. Von Duprin: 98/99 Series
 - b. Sargent: GL-43-80 Series
 - c. Detex: Advantex (Wide Stile)
 - 2. Wide Stile, Electric Latch Retraction:
 - a. Von Duprin: QEL 98/99 Series
 - b. Sargent: GL-43-56-80 Series
 - c. Detex: Advantex-ER (Wide Stile)
 - 3. Lever Trim/Pull Trim:
 - a. Von Duprin: 996/990 Series
 - b. Sargent: 740 ET/800 MAL
 - c. Detex: "D/DM" / "C" Trim
- B. Exit Devices: Comply with BHMA A156.3, Grade 1.
 - 1. Lever design to match lockset trim.
 - 2. Provide cylinder with cylinder dogging or locking trim.
 - 3. Provide exit devices properly sized for door width and height.
 - 4. Provide strike as recommended by manufacturer for application indicated.
 - 5. Provide less bottom rod (LBR) at scheduled locations to eliminate use of floor mounted strikes.
 - 6. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
 - 7. Obtain exit devices from a single manufacturer, although several may be indicated as offering products complying with requirements.
 - 8. Provide a sound-dampening feature to reduce touch pad return noise.
 - 9. Quiet Electric Latch Retraction shall be accomplished using a motor driven assembly, and shall incorporate the following features:

- a. Motor shall retract both the push pad assembly and latchbolt.
 - b. Automatic calibration of latch throw and pull.
 - c. Built-in time delay.
 - d. On-board installation and troubleshooting diagnostics built into power supply and device.
 - e. Retry mode if device does not pull on the first try.
- 10. Provide flush end caps to reduce potential damage from impact.
 - 11. Provide dead-locking latch bolts to ensure security.
 - 12. Provide optional strikes, special length rods, and adapter plates to accommodate door and frame conditions. Provide narrow style series devices in lieu of wide stile series devices where optional strikes will not accommodate door and frame conditions.
 - 13. Coordinate with related trades to ensure adequate clearance and reinforcement is provided in doors and frames. Provide thru bolts as required.
 - 14. Unless specific exit device dogging options are noted within hardware sets, provide dogging options as follows:
 - a. Fire Rated devices: Dogging not permitted.
 - b. Non-Rated Exit Only functions not equipped with outside trim or pull: Less Dogging.
 - c. Non-Rated Classroom functions: Less Dogging.
 - d. Non-Rated devices utilizing electric latch retraction or electrified outside trim: Less Dogging.
 - e. All Other Non-Rated devices: Cylinder Dogging utilizing interchangeable core cylinders. Cylinder keyway shall match locksets furnished on this project.
 - 15. Provide glass bead kits as required to accommodate door conditions. Screws shall not be visible through full glass doors.
 - 16. Where specified, provide compatible keyed mullions with cylinder for pairs of doors.
 - 17. Provide reinforced crossbars for all traditional style exit devices applied to doors over 36" wide.

2.06 ELECTRIC STRIKES

- A. Acceptable manufacturers and respective catalog numbers:
 - 1. Von Duprin 6000 Series.
 - 2. HES 1006 Series.
- B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
 - 1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
 - 2. Provide non-handed (verify voltage with electrical contractor) electric strike suitable for door frame material and scheduled lock configuration.
 - 3. Provide transformer and rectifier as necessary for complete installation.

2.07 LOCK CYLINDERS

- A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 - 1. Provide full size interchangeable core (FSIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
 - 2. Provide cams and/or tailpieces as required for locking devices.
 - 3. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.08 CYLINDRICAL LOCKS

- A. Acceptable manufacturers and respective catalog numbers:
 - 1. Grade 1 Locks:

- a. Schlage ND Series SPA
 - b. Sargent 10/11 Line LP
 - c. Corbin CL3100 PZD
 - d. Best 9K Series 14D
- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1.
 - 1. Bored Hole: 2-1/8 inch (54 mm) diameter.
 - 2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
 - 3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
 - 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.
 - 5. Provide guarded latch bolts for all locksets, and latch bolts with sufficient throw to maintain fire rating of both single and paired door assemblies.
 - 6. Length of strike lip shall be sufficient to clear surrounding trim.
 - 7. Provide wrought boxes for strikes at inactive doors, wood frames, and metal frames without integral mortar covers.

2.09 DOOR PULLS, PUSH PLATES AND PUSH BARS

- A. Acceptable manufacturers and respective catalog numbers:
 - 1. Offset Door Pull (1" dia. 10" ctc):
 - a. Burns 39C
 - b. Hager 12J
 - c. Rockwood BF157
 - d. Ives 8190-0
 - 2. Offset Pull/Push Bar (1" dia. 10" ctc Pull):
 - a. Burns 422 x 39C
 - b. Hager 157
 - c. Rockwood BF15747
 - d. Ives 9190-0
 - 3. Pull Plate (0.050" 6" x 16"):
 - a. Burns 56
 - b. Hager 30S 6 x 16
 - c. Rockwood 70E
 - d. Ives 8200 6" x 16"
 - 4. Pull Plate (1" dia. 10" ctc - 0.050" x 4" x 16"):
 - a. Burns 5426C
 - b. Hager 34J 4 x 16
 - c. Rockwood 111 x 70C
 - d. Ives 8303-0 4" x 16"
- B. Door Pulls, Push Plates, and Push Bars: Complying with BHMA A156.6.
 - 1. Pull Type: Offset, unless otherwise indicated.
 - 2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
 - a. Edges: Beveled, unless otherwise indicated.
 - 3. Bar Type: Push bar, unless otherwise indicated.
 - 4. Material: Aluminum, unless otherwise indicated.

5. Adjust dimensions of push plates to accommodate stile and rail dimensions, lite and louver cutouts, and adjacent hardware. Where required by adjacent hardware, push plates shall be factory drilled for cylinders or other mortised hardware. All push plates shall be beveled 4 sides and counter sunk.
6. Where possible, provide back-to-back, and concealed mounting for pulls and push bars. Push bar length shall be 3" less door width, or center of stile to center of stile for stile & rail or full glass doors.

2.10 COORDINATORS

- A. Acceptable manufacturers and respective catalog numbers:
 1. Bar Coordinator:
 - a. Ives COR x FL
 - b. Door Controls 600 x Filler
 - c. Hager 297D x 297F
 - d. Rockwood 2600 Series
- B. Coordinators: Provide on doors having closers and self-latching or automatic flush bolts to ensure that inactive door leaf closes before active door leaf.
 1. Type: Bar, unless otherwise indicated.
 2. Material: Aluminum, unless otherwise indicated.
 3. Mounting Bracket: As required for application.
 4. Ensure that coordination of other door hardware affected by placement of coordinators and carry bar is applied properly for completely operable installation.

2.11 CLOSERS

- A. Manufacturers; Surface Mounted:
 1. LCN, an Allegion brand; 4011/4111 EDA: www.allegion.com/us/#sle.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Closers: Comply with BHMA A156.4, Grade 1.
 1. Type: Surface mounted to door.
 2. Obtain door closers from a single manufacturer, although several may be indicated as offering products complying with requirements.
 3. Provide extra heavy duty arm (EDA / HD) when closer is to be installed using parallel arm mounting.
 4. Hardware supplier shall coordinate with related trades to ensure aluminum frame profiles will accommodate specified door closers.
 5. Closers shall use high strength cast cylinders, forged main arms, and 1 piece forged steel pistons.
 6. Closers shall utilize a stable fluid withstanding temperature range of +120 deg F to -30 deg F without seasonal adjustment of closer speed to properly close the door. Closers for fire-rated doors shall be provided with temperature stabilizing fluid that complies with standards UL10C.
 7. Unless otherwise specified, all door closers shall have full covers and separate adjusting valves for sweeps, latch, and backcheck.
 8. Provide closers for all labeled doors. Provide closer series and type consistent with other closers for similar doors specified elsewhere on the project.
 9. Provide closers with adjustable spring power. Size closers to ensure exterior and fire rated doors will consistently close and latch doors under existing conditions. Size all other door closers to allow for reduced opening force not to exceed 5 lbs.

10. Install closers on the room side of corridor doors, stair side of stairways and interior side of exterior doors.
11. Closers shall be furnished complete with all mounting brackets and cover plates as required by door and frame conditions, and by adjacent hardware.
12. Door closers shall be provided with a powder coat finish to provide superior protection against the effects of weathering. Powder coat finish shall successfully pass a 100 hour salt spray test.
13. Pressure Relief Valve, PRV, shall not be acceptable.

2.12 OVERHEAD STOPS AND HOLDERS

- A. Acceptable manufacturers and respective catalog numbers:
 1. Surface Mount:
 - a. Glynn-Johnson GJ900 Series
 - b. Rixson 9 Series
 - c. Sargent 590
 2. Concealed Mount:
 - a. Glynn-Johnson GJ100 Series
 - b. Rixson 1 Series
 - c. Sargent 690
- B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.
 1. Overhead stops (including slide block and end caps) shall be fabricated from metal.
 2. Unless otherwise specified, furnish GJ900 series overhead stop for doors equipped with regular arm surface type closers that swing more than 140 degrees before striking a wall, for doors that open against equipment, casework, sidelights, or other objects that would make wall bumpers inappropriate, and as specified in hardware groups.
 3. Furnish sex bolt attachments for wood and mineral core doors unless doors are supplied with proper reinforcing blocks.
 4. Provide special stop only ("SE" suffix) overhead stops when used in conjunction with electronic hold open closers.
 5. Do not provide holder function for labeled doors.

2.13 PROTECTION PLATES

- A. Acceptable manufacturers and respective catalog numbers:
 1. Rockwood K1050
 2. Hager 190S
 3. Ives 8400
 4. Hiawatha J102
- B. Protection Plates: Comply with BHMA A156.6.
 1. Where specified, provide 10" kick plates, 34" armor plates, and 4" mop plates. Unless otherwise specified, metal protective plates shall be .050" thick; plastic plates shall be 1/8" thick.
 2. Protective plates shall be 2" less door width, or 1" less door width at pairs. Protection plates over 16" shall not be provided for labeled doors unless specifically approved by door manufacturers listing.
 3. Where specified, provide surface mounted door edges. Edges shall butt to protective plates. Provide edges with cutouts as required adjacent hardware.

4. Adjust dimensions of protection plates to accommodate stile and rail dimensions, lite and louver cutouts, and adjacent hardware. Where required by adjacent hardware, protection plates shall be factory drilled for cylinders or other mortised hardware.
- C. Metal Properties: Stainless steel.
 1. Metal, Standard Duty: Thickness 0.050 inch (1.27 mm), minimum.
- D. Edges: Beveled, on four sides unless otherwise indicated.
- E. Fasteners: Countersunk screw fasteners.

2.14 ELECTROMAGNETIC DOOR HOLDERS

- A. Acceptable manufacturers and respective catalog numbers:
 1. LCN SEM 7800
 2. ABH 2000
 3. Edwards 1500
- B. Electromagnetic Door Holders: Comply with BHMA A156.15.
 1. Type: Wall mounted, single unit, standard duty, with strike plate attached to door.
 2. Holding Force, Standard Duty: 35 lbs-force (155 N), minimum.
 3. Fail safe; door released to close automatically when electrical current is interrupted.
 4. Housing and armature shall be constructed of a die cast zinc material.
 5. Provide types as listed in groups.
 6. Where wall conditions do not permit the armature to reach the magnet, provide extensions.
 7. Provide proper voltage and power consumption as required by Division 26.
 8. Coordinate electrical requirements and mounting locations with other trades.
 9. Provide interface with fire detectors and fire-alarm system for fire-rated door assemblies.

2.15 WALL STOPS

- A. Acceptable manufacturers and respective catalog numbers:
 1. Wrought Concave Wall Bumper:
 - a. Ives WS406
 - b. Hager 236W
 - c. Burns 575
 - d. Rockwood 409
 2. Automatic Wall Holder:
 - a. Ives WS40
 - b. Hager 326W
 - c. Burns 533
 - d. Rockwood 490
- B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 1. Furnish a stop or holder for all doors. Furnish floor stops or hinge pin stops only where specifically specified.
 2. Where wall stops are not applicable, furnish overhead stops.
 3. Do not provide holder function for labeled doors.

2.16 THRESHOLDS

- A. Acceptable manufacturers and respective catalog numbers:
 1. Zero 8655

2. Pemko 171
 3. National Guard Products 425
 4. Reese S205
- B. Thresholds: Comply with BHMA A156.21.
1. Provide threshold at each exterior door, unless otherwise indicated.
 2. Material: Aluminum.
 3. Threshold Surface: Fluted horizontal grooves across full width.
 4. Provide non-corroding fasteners at exterior locations.
 5. Hardware supplier shall verify all finish floor conditions and coordinate proper threshold as required to insure a smooth transition between threshold and interior floor finish.
 6. Threshold Types:
 - a. Unless otherwise specified, provide saddle threshold similar to Zero 8655 for all exterior openings with an interior floor finish less than or equal to 1/4" in height.
 - b. Unless otherwise specified, provide half saddle threshold similar to Zero 1674 for all exterior openings with an interior floor finish greater than 1/4" in height. Threshold height shall match thickness of interior floor finish.

2.17 WEATHERSTRIPPING AND GASKETING

- A. Acceptable manufacturers and respective catalog numbers:
1. Weatherstrip:
 - a. Zero 429
 - b. Pemko 2981_PK
 - c. National Guard Products 700NA
 - d. Reese 755
 2. Adhesive Gasket:
 - a. Zero 188S
 - b. Pemko S88
 - c. National Guard Products 5050
 - d. Reese 797
 3. Mullion Seal/Silencer
 - a. Zero 8780
 - b. Pemko 5110
 - c. National Guard Products 5100N
 4. Meeting Edge Seals:
 - a. Zero 8193
 - b. Pemko 18041
 - c. National Guard Products 9605
 - d. Reese 959
 5. Automatic Door Bottom:
 - a. Zero 355
 - b. Pemko 42APKL
 - c. National Guard Products 320N
 - d. Reese 372A
 6. Sweeps:
 - a. Zero 8192
 - b. Pemko 18061_NB

- c. National Guard Products B606
 - d. Reese 964
- 7. Sweeps with Drip:
 - a. Zero 8198
 - b. Pemko 345_N
 - c. National Guard Products C627
 - d. Reese 354
- 8. Drip Cap:
 - a. Zero 142
 - b. Pemko 346
 - c. National Guard Products 16
 - d. Reese R201
- B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
 - 1. Head and Jamb Type: Adjustable.
 - 2. Door Sweep Type: Encased in retainer.
 - 3. Material: Aluminum, with brush weatherstripping.
 - 4. Provide gasketing (equal to Zero 188S) for smoke and draft control doors that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
 - 5. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
 - 6. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.18 LATCH PROTECTOR

- A. Latch Protector: Provide on door to protect latch from being tampered with while in locked position.
 - 1. Type: Standard latch protector.
 - 2. Material: Stainless steel.

2.19 KEY CONTROL SYSTEMS

- A. Key Control Systems: Comply with guidelines of BHMA A156.28.
 - 1. Provide keying information in compliance with DHI (KSN) standards.
 - 2. Keying: Grand master keyed.
 - 3. Include control keying with removable core cylinders.
 - 4. Supply keys in following quantities:
 - a. 1 each Grand Master keys.
 - b. 2 each Control keys if new system.
 - c. 2 each Change keys for each keyed core.
 - 5. Deliver keys with identifying tags to Owner by security shipment direct from hardware supplier.
 - 6. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
 - 7. Owner or Owner's agent install permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

2.20 KEY CABINET

- A. Acceptable manufacturers and respective catalog numbers:
 - 1. Lund 1200-1205 AA
 - 2. Key Control M228-2480

3. Telkee RWC-AWC
- B. Key Cabinet: Sheet steel construction, piano hinged door with key lock; BHMA A156.28.
 1. Mounting: Wall-mounted.
 2. Capacity: Actual quantity of keys, plus 50 percent additional capacity.
 3. Size key hooks to hold 6 keys each.
 4. Finish: Baked enamel, manufacturer's standard color.
 5. Key cabinet lock to building keying system.
 6. Furnish key cabinet complete with cam lock, permanent key tags, and change key cards.
 7. Hardware supplier shall prepare all key change index records, tag all keys and place permanent file keys in cabinet.

2.21 DOOR POSITION SWITCHES

- A. Acceptable manufacturers and respective catalog numbers:
 1. Schlage Electronics 679 Series
 2. Sentrol 1076W
 3. Sargent 3287

2.22 POWER SUPPLY

- A. Power Supply: Hard wired, with multiple zones providing eight (8) breakers for each output panel with individual control switches and LED's; UL (DIR) Class 2 listed.
 1. Operating Temperature: 32 to 110 degrees F (0 to 43 degrees C).
 2. 12/24 VDC Output, field selectable.
 3. Class 2 Rated power limited output.
 4. Universal 120-240 VAC input.
 5. Low voltage DC, regulated and filtered.
 6. Polarized connector for distribution boards.
 7. Fused primary input.
 8. AC input and DC output monitoring circuit w/LED indicators.
 9. Cover mounted AC Input indication.
 10. Tested and certified to meet UL294.
 11. NEMA 1 enclosure.
 12. Hinged cover w/lock down screws.
 13. High voltage protective cover.
 14. All electro-mechanical systems requiring fail safe circuits shall be capable of interfacing with the fire alarm system to cut power to appropriate system components. Unless already provided in another system component, all power supplies utilized in fail safe circuits shall include an integral relay which when connected to the N/C fire alarm contact will cut power to all openings connected to the individual power supply. Power supply, unless otherwise specified, will automatically reset itself when fire alarm relay returns to normal state following a fire alarm.

2.23 FINISHES

- A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
 1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
 2. Secondary Finish: 630; satin stainless steel, with stainless steel 3000 series base material (former US equivalent US32D); BHMA A156.18.

- a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.
 - b. Use secondary finish in exterior or high humidity locations.
- 3. Exceptions:
 - a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.
 - b. Door Closer Covers and Arms: Color as selected by Architect from manufacturer's standard colors unless otherwise indicated.
 - c. Aluminum Surface Trim and Gasket Housings: Anodized to match door panel finish, not other hardware, unless otherwise indicated.
 - d. Hardware for Aluminum Entrance Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

PART 3 EXECUTION

3.01 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 for smoke and draft control doors in accordance with NFPA 105.
- C. Use templates provided by hardware item manufacturer.
- D. 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.
 - 1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
 - 2. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 3. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch (1024 mm).
 - b. Push Plates/Pull Bars: 42 inch (1067 mm).
 - c. Deadlocks (Deadbolts): 48 inch (1219 mm).
 - d. Exit Devices: 40-5/16 inch (1024 mm).
 - e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).
- E. 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 ADJUSTING

- A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.04 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.

3.05 PROTECTION

- A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 7105 - HARDWARE GROUPS

HDWE GROUP E1.0

Qty		Description	Product Number	Manufacturer
		Hinges	Existing to remain	
1	EA	Passage Lockset	ND10S	SCH
		All remaining hardware existing to remain		
		Function:		
		Latch bolt by lever at all times.		

HDWE GROUP 1.0

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Passage Lockset	ND10S	SCH
1	EA	Wall Stop	WS406	IVE
		Function:		
		Latch bolt by lever at all times.		

HDWE GROUP 1.1

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Passage Lockset	ND10S	SCH
1	EA	Constant latch flushbolt	FB51T	IVE
2	EA	Wall Stop	WS406	IVE
		Function:		
		Latch bolt by lever at all times.		

HDWE GROUP 1.2

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
2	EA	Roller latch	RL32	IVE
2	EA	Dummy trim	ND170	IVE
1	EA	Wall stop	WS406	IVE
		Function:		
		Fixed lever one side; no latch or chassis; used for door pull.		

HDWE GROUP 3.0

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Classroom Lockset	ND70	SCH
1	EA	Wall Stop	WS406	IVE

Function:

Outside lever locked and unlocked by key. Inside lever always unlocked.

HDWE GROUP 5.0

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Entrance Lock	ND53	SCH
1 EA	Wall Stop	WS406	IVE

Function:

Turn/Push button locking; pushing and turning button locks outside lever requiring use of key until the button is manually unlocked. Push-button locking; pushing button locks outside lever until unlocked by key or by turning the inside lever.

HDWE GROUP 11.0

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Passage lockset	ND10S	SCH
1 EA	Surface Closer	4011/4111 EDA with hold open	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	VON
1 EA	Wall Stop	WS406	IVE

Function:

Both levers always unlocked.

HDWE GROUP 11.1

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Passage lockset	ND10S	SCH
1 EA	Surface Closer	4011/4111 EDA with hold open	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	VON
1 EA	Overhead stop	90S	GLY

Function:

Both levers always unlocked.

HDWE GROUP 12.0

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Privacy Lock	ND40 with occupied indicator	SCH
1 EA	Surface Closer	4011/4111 EDA	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1 EA	Wall Stop	WS406	IVE

Function:

Lever with emergency release recessed slot outside; push button in lever inside; springlatch; in unlocked state latch is retracted by either lever; outside lever is made inoperative by pushing button on inside lever; rotating inside lever retracts latch and releases button unlocking outside lever; closing door also unlocks preventing lockout; emergency unlock; an emergency key or small, flat screwdriver inserted in outside lever and turned releases button to unlock; inside lever always free for immediate egress.

HDWE GROUP 12.1

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Privacy Lock	ND40 with occupied indicator	SCH
1 EA	Surface Closer	4011/4111 EDA	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1 EA	Overhead stop	90S	IVE

Function:

Lever with emergency release recessed slot outside; push button in lever inside; springlatch; in unlocked state latch is retracted by either lever; outside lever is made inoperative by pushing button on inside lever; rotating inside lever retracts latch and releases button unlocking outside lever; closing door also unlocks preventing lockout; emergency unlock; an emergency key or small, flat screwdriver inserted in outside lever and turned releases button to unlock; inside lever always free for immediate egress.

HDWE GROUP 13.3

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Classroom lock	ND70	SCH
1 EA	Surface Closer	4011/4111 EDA with hold open	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE

Function:

Outside lever locked and unlocked by key. Inside lever always unlocked.

HDWE GROUP 14.1

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Storeroom Lockset	ND80	SCH
1 EA	Surface Closer	4011/4111 EDA with hold open	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE

Function:

Outside lever fixed. Entrance by key only. Inside lever always unlocked.

HDWE GROUP 15.0

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Entrance lock	ND53	SCH
1 EA	Surface Closer	4011/4111 EDA	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1 EA	Wall Stop	WS406	IVE
1 EA	Viewer	698	IVE

Function:

Turn/Push button locking; pushing and turning button locks outside lever requiring use of key until the button is manually unlocked. Push-button locking; pushing button locks outside lever until unlocked by key or by turning the inside lever.

HDWE GROUP E18.0

Qty	Description	Product Number	Manufacturer
	Hinges	Existing to remain	
	Lockset	Existing to remain	
1 EA	Electric strike	6211 Fail secure	VON
	Surface Closer	Existing to remain	
	Kick Plate	Existing to remain	
	Wall Stop	Existing to remain	
1 EA	Card Reader	By Access Control Contractor	
1 EA	Door Contact	By Access Control Contractor	
1 EA	Power Supply	As required	
1 EA	Elevation drawing		
1 EA	Wire Diagram	Point to point	

Function:

Outside lever fixed. Entrance by key only. Inside lever always unlocked. Presentation of valid credential momentarily unlocks doors.

HDWE GROUP E18.2

Qty	Description	Product Number	Manufacturer
	Hinges	Existing to remain	
	Lockset	Existing to remain	
1 EA	Electric strike	6211 Fail secure	VON
	Surface Closer	Existing to remain	
	Kick Plate	Existing to remain	
	Wall Stop	Existing to remain	
1 EA	Viewer	698	IVE
1 EA	Card Reader	By Access Control Contractor	
1 EA	Door Contact	By Access Control Contractor	
1 EA	Power Supply	As required	
1 EA	Elevation drawing		
1 EA	Wire Diagram	Point to point	

Function:

Outside lever fixed. Entrance by key only. Inside lever always unlocked. Presentation of valid credential momentarily unlocks doors.

HDWE GROUP 18.0

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Storeroom lock	ND80	SCH
1 EA	Electric strike	6211 Fail secure	VON
1 EA	Surface Closer	4011/4111 EDA with hold open	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1 EA	Wall Stop	WS406	IVE
1 EA	Card Reader	By Access Control Contractor	
1 EA	Door Contact	By Access Control Contractor	
1 EA	Power Supply	As required	
1 EA	Elevation drawing		
1 EA	Wire Diagram	Point to point	

Function:

Outside lever fixed. Entrance by key only. Inside lever always unlocked. Presentation of valid credential momentarily unlocks doors.

HDWE GROUP 18.1

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Storeroom lock	ND80	SCH
1 EA	Electric strike	6211 Fail secure	VON
1 EA	Surface Closer	4011/4111 EDA with hold open	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1 EA	Overhead stop	90S	GLY
1 EA	Card Reader	By Access Control Contractor	
1 EA	Door Contact	By Access Control Contractor	
1 EA	Power Supply	As required	
1 EA	Elevation drawing		
1 EA	Wire Diagram	Point to point	

Function:

Outside lever fixed. Entrance by key only. Inside lever always unlocked. Presentation of valid credential momentarily unlocks doors.

HDWE GROUP 18.2

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Storeroom lock	ND80	SCH
1 EA	Electric strike	6211 Fail secure	VON
1 EA	Surface Closer	4011/4111 EDA	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE

1	EA	Wall Stop	WS406	IVE
1	EA	Viewer	698	IVE
1	EA	Card Reader	By Access Control Contractor	
1	EA	Door Contact	By Access Control Contractor	
1	EA	Power Supply	As required	
1	EA	Elevation drawing		
1	EA	Wire Diagram	Point to point	

Function:

Outside lever fixed. Entrance by key only. Inside lever always unlocked. Presentation of valid credential momentarily unlocks doors.

HDWE GROUP 18.3

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Institutional lock	ND82	SCH
1 EA	Electric strike	6211 Fail secure	VON
1 EA	Surface Closer	4011/4111 EDA	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1 EA	Wall Stop	WS406	IVE
1 EA	Viewer	698	IVE
2 EA	Card Reader	By Access Control Contractor	
1 EA	Door Contact	By Access Control Contractor	
1 EA	Power Supply	As required	
1 EA	Elevation drawing		
1 EA	Wire Diagram	Point to point	

Function:

Both levers always fixed. Key in either side retracts latchbolt. Valid credential either side momentarily releases strike.

HDWE GROUP 19.0

Qty	Description	Product Number	Manufacturer
	Hinges	As specified	IVE
1 EA	Push Plate	8200 6" x 16"	IVE
1 EA	Pull plate	8302 10" 4" x 16"	IVE
1 EA	Surface closer	4011/4111 EDA	LCN
1 EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1 EA	Wall Stop	WS406	IVE

Function:

Push/pull

HDWE GROUP 31.0

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Panic hardware	99-L-BE	VON
1	EA	Surface Closer	4011/4111 EDA with hold open	LCN
1	EA	Kick Plate	8400 10" x 2" LDW B4E	IVE

Function:

Latchbolt retracted by depressing the actuation bar. Entrance by lever, always active, no cylinder.

HDWE GROUP 33.1

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Panic hardware	99-L	VON
1	EA	Surface Closer	4011/4111 EDA with hold open	LCN
1	EA	Kick Plate	8400 10" x 2" LDW B4E	IVE

Function:

Latchbolt retracted by depressing the actuation bar on push side or lever on pull side. Lever locked and unlocked by key.

HDWE GROUP 38.1

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Panic hardware	LD-99-NL-L	SCH
1	EA	Electric strike	6000 Series	VON
1	EA	Surface Closer	4011/4111 EDA	LCN
1	EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1	EA	Wall Stop	WS406	IVE
1	EA	Viewer	698	IVE
1	EA	Card Reader	By Access Control Contractor	
1	EA	Door Contact	By Access Control Contractor	
1	EA	Power Supply	As required	
1	EA	Elevation drawing		
1	EA	Wire Diagram	Point to point	

Function:

Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Doors locks when key is removed and door is closed. Electric strike controlled by card reader.

HDWE GROUP 38.2

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Power transfer	EPT10	VON
1	EA	Delayed egress panic device	CX-99-L-NL	SCH
1	EA	Electric strike	6000 Series	VON
1	EA	Surface Closer	4011/4111 EDA	LCN
1	EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1	EA	Magnetic hold open	SEM7800	LCN
1	EA	Card Reader	By Access Control Contractor	
1	EA	Door Contact	By Access Control Contractor	
1	EA	Power Supply	As required	
1	EA	Elevation drawing		
1	EA	Wire Diagram	Point to point	

Function:

Latchbolt retracted by key in cylinder on pull side or by pressing actuation bar on push side. Pressing actuation bar will sound alarm and open after 15 seconds. Fire alarm or valid credential will shunt alarm and allow immediate egress. Magnetic hold open tied to access control system.

HDWE GROUP 48.0

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
2	EA	Panic hardware	QEL-9927-NL-L	SCH
2	EA	Power transfer	EPT10	VON
2	EA	Surface Closer	4011/4111 EDA with hold open	LCN
2	EA	Kick Plate	8400 10" x 1" LDW B4E	IVE
2	EA	Wall Stop	WS406	IVE
1	EA	Card Reader	By Access Control Contractor	
2	EA	Door Contact	By Access Control Contractor	
1	EA	Power Supply	As required	
1	EA	Elevation drawing		
1	EA	Wire Diagram	Point to point	

Function:

Latchbolt retracted inside by exit device push pad and outside by key in cylinder. Doors locks when key is removed and door is closed. Electrified latch controlled by card reader.

HDWE GROUP 118.0

Qty		Description	Product Number	Manufacturer
		Hinges	As specified	IVE
1	EA	Power transfer	EPT10	VON
1	EA	Electric storeroom lock	ND80EU	SCH
1	EA	Lock guard	LG	IVE
1	EA	Surface Closer	4011/4111 EDA	LCN

1	EA	Kick Plate	8400 10" x 2" LDW B4E	IVE
1	EA	Overhead stop	90S	GLY
1	EA	Rain Drip	142	ZER
1	Set	Weatherstripping	429	ZER
1	EA	Door Sweep w/ Drip	8198	ZER
1	EA	Threshold	8655	ZER
1	EA	Card Reader	By Access Control Contractor	
1	EA	Door Contact	By Access Control Contractor	
1	EA	Power Supply	As required	
1	EA	Elevation drawing		
1	EA	Wire Diagram	Point to point	

Function:

Outside lever fixed. Entrance by key only. Inside lever always unlocked. Presentation of valid credential momentarily unlocks doors.

HDWE GROUP 269.0

Qty		Description	Product Number	Manufacturer
1	EA	Continuous hinge	700	IVE
2	EA	Pull/push bar	9103-0	IVE
1	EA	Surface auto operator	4642	LCN
2	EA	Actuator, wall mount	8310-853	LCN
1	EA	Surface closer	4011/4111 EDA	LCN
2	EA	Overhead stop	100S	GLY

Function:

Push/pull

HDWE GROUP 368.0

Qty		Description	Product Number	Manufacturer
2	EA	Continuous hinge	700 x EPT	IVE
2	EA	Power Transfer	EPT10	VON
1	EA	Keyed Removable Mullion	KR4954	VON
1	EA	Electric Panic Hardware	QEL+-99-NL-OP	VON
1	EA	Electric Panic Hardware	QEL-99-EO	VON
2	EA	Door pull, 1" round	8190 10"	IVE
1	EA	OH Stop	100S	GLY
1	EA	Surface auto operator	4642	LCN
2	EA	Actuator, wall mount	8310-853	LCN
1	EA	Surface Closer	4011/4111 EDA	LCN
1	EA	Rain Drip	142A	ZER
1	Set	Weather Strip	By Door Manufacturer	
1	EA	Mullion Seal	8780	ZER
2	EA	Door Sweep w/Drip	8198	ZER
1	EA	Threshold	8655	ZER
1	EA	Card Reader	By Access Control Contractor	
2	EA	Door Contact	By Access Control Contractor	
1	EA	Power Supply	As required	

- 1 EA Elevation drawing
- 1 EA Wire Diagram Point to Point

Function:

Latchbolt retracted inside by device push pad and outside by key in cylinder. Door locks when key is removed. Valid credential will momentarily unlock the door. Door relocks when card reader times out.

END OF SECTION

SECTION 08 7113 - POWER DOOR OPERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Operators for swinging doors.
- B. Controllers, actuators, and safety devices.

1.02 RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Balance of door hardware.

1.03 REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- C. BHMA A156.10 - Power Operated Pedestrian Doors; 2024.
- D. BHMA A156.19 - Power Assist and Low Energy Power Operated Swinging Doors; 2019.
- E. ITS (DIR) - Directory of Listed Products; Current Edition.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
 - 2. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.
- C. Product Data: Provide data on system components, sizes, features, and finishes.
- D. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Operators for Swinging Doors:
 - 1. dormakaba; ED100 Series: www.dormakaba.com/#sle.
 - 2. LCN, an Allegion brand; 4642: www.allegion.com/us/#sle.
 - 3. NABCO Entrances Inc; GT 710 Low Energy (ADA) Automatic Door: www.nabcoentrances.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 POWER DOOR OPERATORS - GENERAL

- A. Electrically Operated or Controlled Hardware: Provide necessary power supplies, relays, and interfaces as required for proper operation; provide wiring between control components and to building power connection in compliance with NFPA 70.
- B. Comply with ADA Standards for egress requirements.
- C. Comply with NFPA 101 and requirements of authorities having jurisdiction; provide units selected for actual door weight and for light pedestrian traffic unless otherwise indicated.
- D. Exterior and Vestibule Doors: Provide equipment suitable for ambient operating temperature range of minus 20 to plus 140 degrees F (minus 29 to plus 60 degrees C).
- E. Exterior Doors: Provide units capable of operating, closing, and holding doors closed under positive and negative differential pressure; if necessary, provide power closing.
- F. Fire Door Operators: In addition to other requirements, provide equipment ITS (DIR) or UL (DIR) listed as a fire door operator with automatic closer.
- G. System Integration: Integrate operator functionality with other systems as required for a complete working installation.
 - 1. Provide time delay relay to signal automatic door operator to activate only after electric lock system is released.
 - 2. Provide fire alarm interface configurable to safely open or close doors on signal from fire alarm system.
 - 3. Provide controller output signals at the door closed or door open positions to facilitate interaction with security and access control systems.

2.03 OPERATORS FOR SWINGING DOORS

- A. Door Operator: Pneumatic/Hydraulic.
 - 1. Applications: Include operators for single and double doors.
 - 2. Pneumatic/Hydraulic Operators: Low voltage control system, pneumatic activation to hydraulic device for opening and closing.
 - 3. Speed Control: Variable, field-adjustable opening and closing cycles.
 - 4. Functionality: Full-power open, spring close operation.
 - a. Low-Energy Power Operators: Comply with BHMA A156.19; operator activated by pushing or pulling the door or by manual actuator, not a sensor; safeties not required.
 - 5. Mounting: Surface mounted overhead.
 - 6. Power Supply Units: Self-contained, electrically operated, and independent of door operator.
 - 7. Actuators: See Section 08 7100.
 - 8. Hold Open: Toggle switch at inside head of doors; deactivate hold-open on activation of fire alarm system, see Section 28 4600.

2.04 CONTROLLERS, ACTUATORS, AND SAFETY DEVICES

- A. Controllers: Manufacturer's standard for products specified.
- B. Safety Devices: Manufacturer's standard units recommended for project applications and conditions.
 - 1. Comply with BHMA A156.10 for actuator and safety types and zones.

2.05 FINISHES

- A. Aluminum Finishes: Manufacturer's standard.
 - 1. Class I Natural Anodized Finish: Clear anodic coating; AAMA 611 AA-M12C22A41, minimum dry film thickness (DFT) of 0.7 mil, 0.0007 inch (0.018 mm).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available, in the correct location, and of the correct characteristics.

3.02 INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.

3.03 ADJUSTING

- A. Adjust door equipment for correct function and smooth operation.

END OF SECTION

SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 07 2600 - Vapor Retarders.
- B. Section 07 2700 - Air Barriers.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.
- G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.
- H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- I. BS EN 14179-1 - Glass in Building - Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass - Part 1: Definition and Description; 2016.
- J. GANA (GM) - GANA Glazing Manual; 2022.
- K. GANA (SM) - GANA Sealant Manual; 2008.
- L. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).
- N. ITS (DIR) - Directory of Listed Products; Current Edition.
- O. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- P. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.
- Q. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.
- R. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F (4 degrees C).
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.
- C. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NIS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Float Glass Manufacturers:
 - 1. Cardinal Glass Industries: www.cardinalcorp.com.
 - 2. Guardian Glass, LLC: www.guardianglass.com.
 - 3. Oldcastle Building Envelope: obe.com.
 - 4. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 - 1. Design Pressure: Calculated in accordance with applicable codes.
 - 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 - 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 - 4. Glass thicknesses listed are minimum.
- B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
 - 1. In conjunction with weather barrier related materials described in other sections, as follows:
 - a. Vapor Retarders: See Section 07 2600.
 - b. Air Barriers: See Section 07 2700.

2. To utilize inner pane of multiple pane insulating glass units for continuity of vapor retarder and/or air barrier seal.
 3. To maintain a continuous vapor retarder and/or air barrier throughout glazed assembly from glass pane to heel bead of glazing sealant.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer program.
 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated. All glazing shall be tempered as required by codes, and as required to meet thermal stress and wind loads.
1. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
 2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
 3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 4. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on all applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with BS EN 14179-1.

2.04 INSULATING GLASS UNITS

- A. Manufacturers:
1. Cardinal Glass Industries: www.cardinalcorp.com.
 2. Guardian Glass, LLC: www.guardianglass.com.
 3. Oldcastle Building Envelope: obe.com.
 4. Pilkington North America Inc: www.pilkington.com.
 5. Viracon: www.viracon.com.
 6. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com.
 7. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
 2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Warm-Edge Spacers: Flexible silicone with polyisobutylene (PIB) primary seal.
 - a. Spacer Width: As required for specified insulating glass unit.
 4. Spacer Color: Black.
 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 6. Color: Black.

7. Purge interpane space with dry air, hermetically sealed.
- C. Insulating Glass Units (INSUL GL-1): Vision glass, double glazed.
 1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #2 surface.
 - 1) Basis of Design:
 - (a) Guardian Industries: SunGuard SNX 62/27.
 - (b) Vitro Architectural Glass: Solarban 70.
 - (c) Viracon: VNE1-63.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 5. Total Thickness: 1 inch (25.4 mm).
 6. Thermal Transmittance (U-Value) Winter - Center of Glass: 0.24, maximum.
 7. Visible Light Transmittance (VLT): 62 percent, minimum.
 8. Solar Heat Gain Coefficient (SHGC): 0.26, maximum.
 9. Visible Light Reflectance, Outside: 11 percent, minimum.
 10. Visible Light Reflectance, Inside: 12 percent, minimum.
 11. Glazing Method: Dry glazing method, gasket glazing.
- D. Insulating Glass Units (INSUL GL-40): Spandrel glazing.
 1. Applications: Exterior spandrel glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Same as on vision units, on #2 surface.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch (6.4 mm) thick.
 - a. Opacifier: Ceramic frit, on #4 surface.
 - b. Opacifier Color: As selected by Architect.
 5. Total Thickness: 1 inch (25.4 mm).

2.05 GLAZING UNITS

- A. Monolithic Safety Glazing: Non-fire-rated.
 1. Applications: Interior glazing, unless otherwise indicated.
 - a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
 2. Glass Type: Fully tempered float glass.
 3. Glass Type: Fully tempered safety glass as specified.
 - a. Thickness:
 - 1) (GL-1): 1/4 inch (6.4 mm), nominal.

2.06 GLAZING COMPOUNDS

- A. Manufacturers:
 1. Bostik Inc: www.bostik-us.com.
 2. Dow Corning Corporation: www.dowcorning.com/construction.

3. Momentive Performance Materials, Inc: www.momentive.com.
4. Pecora Corporation: www.pecora.com.
5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

2.07 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Verify that sealing between joints of glass framing members has been completed effectively.
- D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, and paint.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 8800 - SPECIAL FUNCTION GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Laminated security glazing units.

1.02 RELATED REQUIREMENTS

- A. Section 08 4313 - Aluminum-Framed Storefronts: Security glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.
- I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
- J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- L. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.
- M. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.
- N. ASTM F1233 - Standard Test Method for Security Glazing Materials And Systems; 2021.
- O. ASTM F1642/F1642M - Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings; 2017.
- P. ASTM F1915 - Standard Test Methods for Glazing for Detention Facilities; 2005 (Reapproved 2025).
- Q. ASTM F2248 - Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass; 2019.
- R. GANA (GM) - GANA Glazing Manual; 2022.
- S. GANA (SM) - GANA Sealant Manual; 2008.
- T. GSA TS01 - Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings; General Services Administration; 2003.
- U. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).
- V. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.
- W. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

- X. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2023.
- Y. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.
- Z. UFC 4-010-01 - DoD Minimum Antiterrorism Standards for Buildings; 2018, with Editorial Revision (2024).
- AA. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.
- BB. UL 972 - Standard for Burglary Resisting Glazing Material; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, and special application requirements. Identify available colors.
- C. Manufacturer's qualification statement.
- D. Fabricator's qualification statement.
- E. Executed warranty.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with GANA (GM), GANA (SM), IGMA TM-3000, and NGA (LGRM) for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- C. Fabricator Qualifications: Certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Polycarbonate Glazing: Provide 5-year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Security Glass Manufacturers:
 - 1. Total Security Solutions: www.security.tssbulletproof.com.
 - 2. PRL Glass Systems: www.prlglass.com.
 - 3. Armormax: www.armormax.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LAMINATED SECURITY GLAZING UNITS

- A. Security Glazing (SECURITY GL-1): Laminated glass and polycarbonate, multi-ply; ASTM C1349.
 - 1. Applications: Locations as indicated on drawings.
 - 2. Tint: Clear.
 - 3. Thickness: As required to meet performance criteria.
 - 4. Outer Lite: Heat-strengthened glass.
 - 5. Interlayer, Outboard Side: Thermoplastic urethane (TPU), thickness as required to meet performance criteria.
 - 6. Outer Middle Lite: Tempered glass.

7. Interlayer, Middle Layer: Thermoplastic urethane (TPU), thickness as required to meet performance criteria.
8. Inner Middle Lite: Tempered glass.
9. Interlayer, Inboard Side: Thermoplastic urethane (TPU), thickness as required to meet performance criteria.
10. Inside Lite: Polycarbonate.
11. Performance Criteria:
 - a. Bullet Resistance: Pass UL 752 tests to comply with Level 3: 44 magnum, lead semi-wadcutter gas checked ballistic criteria and weapon description.
12. Glazing Method: As required to meet performance criteria.
13. Frame: Extruded aluminum frame.

2.03 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4-inch (100 mm) width of glazing rabbet space minus 1/16-inch (1.5 mm) height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inches (75 mm) long by one-half height of glazing stop by thickness to suit application; self-adhesive on one face.
- C. Glazing Tape, Back-Bedding Mastic: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod for application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

2.04 SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean and free of obstructions that impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate-compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in accordance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 INSTALLATION - DRY GLAZING METHOD, GASKET GLAZING

- A. Application: Set glazing infills from either exterior or interior of building.

- B. Place setting blocks at 1/4 points with edge block no more than 6 inches (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 INSTALLATION - WET GLAZING METHOD, SEALANT AND SEALANT

- A. Application - Exterior Glazed: Set glazing infills from exterior of building.
- B. Place setting blocks at 1/4 points and install glazing pane or unit.
- C. Install removable stops with glazing centered in space by inserting spacer shims on both sides at 24-inch (610 mm) intervals, 1/4 inch (6.4 mm) below sight line.
- D. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.06 INSTALLATION - WET/DRY GLAZING METHOD, TAPE AND SEALANT

- A. Application - Interior Glazed: Set glazing infills from interior of building.
- B. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches (152 mm) from corners.
- D. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
- E. Install removable stops with spacer shims inserted between glazing and applied stops at 24-inch (610 mm) intervals, 1/4 inch (6 mm) below sight line.
- F. Carefully trim protruding tape with knife.

3.07 INSTALLATION - BUTT JOINT GLAZING METHOD, SEALANT ONLY

- A. Application - Exterior Glazed: Set glazing infills from exterior side of building.
- B. Temporarily brace glass in position for duration of glazing process; mask edges of glass at adjoining glass edges and between glass edges and framing members.
- C. Temporarily secure small-diameter nonadhering foamed rod on back side of joint.
- D. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod, and then tool sealant surface smooth to concave profile.
- E. Permit sealant to cure, remove foam backer rod, apply sealant to opposite side, and tool smooth to concave profile.
- F. Remove masking tape.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Glass and Glazing: Product manufacturers provide field surveillance of installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.09 CLEANING

- A. Remove excess glazing materials from finished surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.10 PROTECTION

- A. After installation, mark pane with 'X' using removable plastic tape or paste.
- B. Remove and replace glass damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 2600 - Vapor Retarders: Vapor-impermeable membranes.
- B. Section 07 8400 - Firestopping: Top-of-wall assemblies at fire-resistance-rated walls.
- C. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.03 REFERENCE STANDARDS

- A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- C. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- D. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).
- E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2024.
- H. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- I. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2024.
- J. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing; 2018 (Reapproved 2023).
- K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
- L. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- M. ASTM E413 - Classification for Rating Sound Insulation; 2022.
- N. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.
- O. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

- P. UL (FRD) - Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on metal framing, gypsum board, glass mat faced gypsum board, accessories, and joint finishing system.

PART 2 PRODUCTS

2.01 PRODUCT REQUIREMENTS

- A. Products listed as Basis of Design have been selected for specific criteria. Products from other manufacturer's listed herein, and/or substitutions will only be accepted if they meet, or exceed, the performance of the Basis of Design. Manufacturer must be able to provide documentation showing that the product meets, or exceeds, the Basis of Design.

2.02 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Shaft Walls at Elevator Shafts: Provide completed assemblies with the following characteristics:
 - 1. Air Pressure Within Shaft: Intermittent loads of 5 lbf/sq ft (0.24 kPa) with maximum mid-span deflection of L/240.
 - 2. Acoustic Attenuation: STC of 35-39 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire-Resistance-Rated Assemblies: Provide completed assemblies with the following characteristics:
 - 1. Gypsum Association File Numbers: Comply with requirements of GA-234 and GA-600 for the particular assembly.
 - 2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.03 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
- B. Basis of Design: ClarkDietrich; www.clarkdietrich.com.
- C. Other Acceptable Manufactures provided they meet or exceed the Basis of Design performance requirements - Metal Framing, Connectors, and Accessories:
 - 1. MarinoWARE: www.marinoware.com/#sle.
 - 2. SCAFCO Corporation: www.scafco.com.
 - 3. Steel Construction Systems: www.steelconsystems.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- D. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
 - 1. Provide minimum CP 90 corrosion protection where installed in exterior applications and humid environments.
 - 2. Studs: "C" shaped with flat or formed webs with knurled faces.
 - a. (MET STUD-2): Provide 20 gauge studs unless noted otherwise.
 - 3. Runners: U shaped, sized to match studs.
 - 4. Furring (FUR-2): 'Z' furring channels. See drawings for depth.

- E. Resilient Furring Channels (FUR-4): 1/2 inch (12 mm) depth, for attachment to substrate through one leg only.
 - 1. Products:
 - a. Same manufacturer as other framing materials.
 - b. ClarkDietrich; RC Deluxe Resilient Channel: www.clarkdietrich.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- F. Thermal Sub-Framing Spacer (FUR-5): Pultruded fiber glass and thermoset resin insulation clip.
 - 1. Spacer Thickness: 3/16 inches, nominal.
 - 2. Spacer Depth: As indicated in drawings. Provide manufacturer's recommended corrosion resistant fasteners.
 - 3. Provide 'Z' furring channels as indicated on the drawings and as specified above.
 - 4. Basis of Design:
 - a. Advanced Architectural Products SMARTci Systems: GreenGirt-Simple Z; www.smartcisystems.com.
 - b. Cascadia Windows, Inc: Cascadia Clip; www.cascadiacclip.com.
 - c. exoGIRT; www.exo-girt.com.
 - d. Knight Wall Systems: KWS MFI System Cladding Attachment; knightwallsystems.com.
 - e. Northern Facades; ISO Clip: www.northernfacades.com.
 - f. Strongwell: Strongirt; www.strongirt.com.
 - g. Substitutions: See Section 01 6000 - Product Requirements.

2.04 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. CertainTeed Corporation: www.certainteed.com/.
 - 2. Georgia-Pacific Gypsum: www.gpgypsum.com.
 - 3. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com.
 - 4. USG Corporation: www.usg.com.
 - 5. Substitutions: See Section 01 6000 - 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. Material ID:
 - a. (GYP BD-1): 5/8 inch Type X.
 - 2. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 3. 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.
 - 4. Basis of Design: USG Corporation; Sheetrock Brand EcoSmart Gypsum Panels: www.usg.com.
 - 5. Other Acceptable Paper-Faced Products provided they meet or exceed the Basis of Design performance requirements:
 - a. CertainTeed Corporation; Type X Drywall: www.certainteed.com.
 - b. Georgia-Pacific Gypsum; ToughRock: www.gpgypsum.com.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond Fire-Shield Gypsum Board: www.goldbondbuilding.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- C. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.

1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Type X Thickness (GYP BD-6): 5/8 inch (16 mm).
3. Edges: Tapered.
4. Basis of Design: USG Corporation; Sheetrock Brand Mold Tough EcoSmart.
5. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Fire-Shield Gypsum Board: www.goldbondbuilding.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
 1. Application: Exterior sheathing, unless otherwise indicated.
 2. Glass Mat Faced Sheathing: Glass mat faced gypsum substrate as defined in ASTM C1177/C1177M.
 3. Core Type: Type X.
 4. Type X Thickness (GYP SHTG-2): 5/8 inch (16 mm).
 5. Edges: Square.
 6. Basis of Design: USG Corporation; Securerock Brand Ultralight Glass-Mat Sheathing: www.usg.com.
 7. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements:
 - a. CertainTeed Corporation; GlasRoc Type X Exterior Sheathing: www.certainteed.com.
 - b. Georgia-Pacific Gypsum; DensGlass Sheathing: www.gpgypsum.com.
 - c. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Fire-Shield Sheathing: www.goldbondbuilding.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation (INSUL-80): ASTM C665; preformed fiber glass or mineral fiber, friction fit type, unfaced. Thickness: 3-1/2 inch (84 mm), minimum. Insulation should fill the cavity.
 1. Basis of Design: Owens Corning Unfaced Ecotouch Insulation.
 - a. Other Acceptable Products provided they meet or exceed the Basis of Design performance requirements.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Vapor Retarder: See Section 07 2600.
- D. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.
 1. Reveal Molding (GYP ACC-1): Model DRM-625-625 by Fry Reglet.
 - a. Color: White.
 2. Acoustical Molding (GYP ACC-2): Model FDA-625 by Fry Reglet.
 - a. Color: White.
 3. Types: As detailed or required for finished appearance.
- E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 1. Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners.

2. Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C1007/AISI S220 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
- C. Studs: Space studs at 16 inches on center (at 406 mm on center).
 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.
- F. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.
- G. Furring for Fire-Resistance Ratings: Install as required for fire-resistance ratings indicated and to GA-600 requirements.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 1. Place continuous bead at perimeter of each layer of gypsum board.
 2. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 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. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
 1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.
- E. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.05 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 (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
 - 2. Provide a control joint at both sides of the wall at every door frame. Locate at hinge side of door.
 - 3. Provide a control joint at both sides of the wall at openings in the wall. Provide on one side of the opening for openings 48 inches wide or less. For openings over 48 inches, provide on both sides of the opening.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. 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: Wall areas above finished ceilings, whether or not accessible in the completed construction.
- D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
- E. 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.

3.07 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION

SECTION 09 3000 - TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.
- B. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.
- C. ANSI A108.20 - American National Standard Specifications for Exterior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs; 2020.
- D. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2021.
- E. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.
- F. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2023.
- G. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2023.
- H. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.
- I. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.
- J. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Samples: Provide two tiles, actual size, illustrating pattern and color.
- D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 10 sq ft (1 sq m) of each size, color, and surface finish combination.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. See Section 01 7419 - Construction Waste Management and Disposal for packaging waste requirements.
- B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

1.08 WARRANTY

- A. Tile and Stone Installation System Warranty: Manufacturer's standard system warranty protecting against break down or deterioration of the tile setting system under normal usage, and ensuring the products are free from manufacturer defects. Manufacturer shall pay for replacement of its own products and replacement of finishing materials, including labor, for defective portions of the project.
 1. Warranty Period: 25 years.

PART 2 PRODUCTS

2.01 TILE

- A. Tile (T-#): ANSI A137.1 standard grade.
 1. Basis of Design: See drawings for product information.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim (MT-#): Brushed stainless steel, style and dimensions to suit application, set with tile mortar or adhesive.
 1. Basis of Design: See drawings for product information.

2.03 SETTING MATERIALS

- A. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.
 1. Applications: Use this type of bond coat where indicated, and where no other type of bond coat is indicated.
 - a. Typical Floors:
 - 1) LATICRETE 254 Platinum.
 - 2) TEC Specialty Full Flex.
 - b. Typical Walls:
 - 1) LATICRETE Tri Lite.
 - 2) TEC Specialty Ultimate Large Tile.
 2. Products:
 - a. H.B. Fuller Construction Products, Inc: www.tecspecialty.com/#sle.
 - b. LATICRETE International, Inc: www.laticrete.com/#sle.
 - c. Mapei Corporation: www.mapei.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GROUTS

- A. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.

1. Applications: Use this type of grout for typical walls.
 2. Use sanded grout for joints 1/8 inch (3.2 mm) wide and larger; use unsanded grout for joints less than 1/8 inch (3.2 mm) wide.
 3. Color: As selected by Architect from manufacturer's full line.
 4. Basis of Design:
 - a. H.B. Fuller Construction Products, Inc; TEC AccuColor Plus Grout: www.tecspecialty.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE PERMACOLOR Select Grout: www.laticrete.com/#sle.
 - c. Mapei Corporation; Ultracolor Plus FA: www.mapei.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Applications: Use where indicated on drawings.
 2. Color: As selected by Architect from manufacturer's full line.
 3. Basis of Design:
 - a. Tile Floors:
 - 1) H.B. Fuller Construction Products, Inc; TEC AccuColor EFX Epoxy Special Effects Grout: www.tecspecialty.com.
 - 2) LATICRETE International, Inc; LATICRETE SpectraLOCK PRO Premium Grout.
 - 3) Mapei Corporation: www.mapei.com.

2.05 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
 2. Color: As selected by Architect from manufacturer's full line.
 3. Products:
 - a. LATICRETE International, Inc; LATICRETE LATASIL: www.laticrete.com/#sle.
 - b. TEC Specialty; Silicone Caulk.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.06 ACCESSORY MATERIALS

- A. Waterproofing Membrane: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
1. Application: Provide at walls, ceilings and floors in showers only.
 2. Fluid or Trowel Applied Type:
 - a. Products:
 - 1) LATICRETE International, Inc; LATICRETE HYDRO BAN: www.laticrete.com/#sle.
 - 2) TEC Specialty; HydraFlex.
 - 3) Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive tile.

- B. Verify wall surfaces are smooth and flat within tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Vacuum clean surfaces and damp clean.
- B. Seal substrate surface cracks with filler.
- C. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108/A118/A136, manufacturer's instructions, and TCNA (HB) or TCNA (HB-GP) recommendations, as applicable.
- B. Lay tile to pattern indicated on drawings. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated on drawings. Use standard grout unless otherwise indicated on drawings.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F115, with epoxy grout. Provide waterproofing membrane under all tile.
 - 1. Use uncoupling membrane under tile unless other underlayment is indicated on drawings.

3.05 INSTALLATION - WALL TILE

- A. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.
- B. Over gypsum wallboard on wood or metal studs, install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat.

3.06 CLEANING

- A. Clean tile and grout surfaces.

3.07 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Divisions 21 through 28 for mechanical and electrical components in acoustical ceilings.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- B. 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 E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.
- E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two samples 4 x 6 inch (100 x 150 mm) in size illustrating material and finish of acoustical units.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.06 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.07 FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrongceilings.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. USG Corporation: www.usg.com/ceilings.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Suspension Systems:
 - 1. Armstrong World Industries, Inc: www.armstrongceilings.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Rockfon, LLC: www.rockfon.com.
 - 4. USG Corporation: www.usg.com/ceilings.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.
 - 1. VOC Content: As specified in Section 01 6116.
- B. Acoustical : Glass fiber with membrane-faced overlay, with the following characteristics:
 - 1. Classification: ASTM E1264, type B.
 - a. Form: B2.
 - b. Pattern: "E" - lightly textured.
 - 2. Size:
 - a. (ACT-1): 24 x 24 inches.
 - b. (ACT-2): 24 x 72 inches.
 - 3. Thickness: 1 inch (25 mm).
 - 4. NRC Range: 0.95, determined in accordance with ASTM E1264.
 - 5. Articulation Class (AC): 180-190, determined in accordance with ASTM E1264.
 - 6. Color: White.
 - 7. Suspension System: Exposed.
 - 8. Products:
 - a. Armstrong World Industries, Inc; Optima Tegular: www.armstrongceilings.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 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.
 - 1. Materials:
 - a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
- B. Exposed Suspension System: Hot-dipped galvanized steel grid and cap.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 9/16 inch (14 mm) face width.
 - 3. Finish: Baked enamel.
 - 4. Color: White.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Perimeter Moldings: Same metal and finish as grid.
 - 1. Size: As required for installation conditions.
 - 2. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

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 C636/C636M, ASTM E580/E580M, ASTM C636/C636M, ASTM E580/E580M, ASTM C636/C636M, and ASTM E580/E580M and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected plan.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Miter 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. 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.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- I. 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.

- 2. Double cut and field paint exposed reveal edges.
- F. Where round obstructions occur, provide preformed closures to match perimeter molding.
- G. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500 - RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Resilient stair accessories.
- D. Installation accessories.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

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. ASTM F2195 - Standard Specification for Linoleum Floor Tile; 2018 (Reapproved 2023).
- D. 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 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Flooring Material: 100 square feet (9.29 square meters) of each type and color.
 - 3. Extra Wall Base: 20 linear feet (6.1 linear meters) of each type and color.

1.05 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 (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

1.06 WARRANTY

- A. Manufacturer's standard limited 5 year commercial warranty.

PART 2 PRODUCTS

2.01 TILE FLOORING

- A. Luxury Vinyl Tile (LVT-#): Homogeneous wear layer bonded to backing, with color and pattern through wear layer thickness.

1. Basis of Design: See drawings for product information.
2. Minimum Requirements: Comply with ASTM 1700, Class 3 Type B.
3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648, NFPA 253, ASTM E648, or NFPA 253.
4. Backing: Synthetic fabric.
5. Thickness: 0.100 inch (2.5 mm), minimum, excluding backing.

2.02 STAIR COVERING

- A. Stair Nosings: 1-1/2 inch (38 mm) horizontal return, 1-1/8 inch (28.5 mm) vertical return, full width of stair tread in one piece.
 1. Material: Rubber.

2.03 RESILIENT BASE

- A. Resilient Base (RB-#): ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
 1. Basis of Design: See drawings for product information.
 2. Height: 4 inches (100 mm).
 3. Thickness: 0.125 inch (3.2 mm).
 4. Finish: Satin.
 5. Length: Roll.

2.04 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips (RTS-1): Same material as resilient base color to match.
- D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
 1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.
- B. Prohibit traffic until filler is fully cured.
- C. Clean substrate.
- D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Fit joints and butt seams tightly.
 - 3. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern, unless indicated otherwise in drawings.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) 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.

3.06 INSTALLATION - STAIR COVERINGS

- A. Install stair coverings in one piece for full width and depth of tread.
- B. Adhere over entire surface. Fit accurately and securely.

3.07 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6813 - TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

1.03 REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
- C. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

1.04 SUBMITTALS

- A. See Section 01 3000 - 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. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.

1.06 FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Tile Carpeting (CPT-#): Each type manufactured in one color dye lot.
 - 1. See drawings for schedule of carpet tiles.

2.02 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

- B. Edge Strips: Rubber, color as selected by Architect.
- C. Adhesives:
 - 1. Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.
- D. 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 required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Trim carpet tile neatly at walls and around interruptions.
- F. 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.

END OF SECTION

SECTION 09 7200 - WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Wall covering.

1.02 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on wall covering and adhesive.
- C. Shop Drawings: Indicate wall elevations with seaming layout.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Package and label each roll by manufacturer, color and pattern, and destination room number.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inspect roll materials at arrival on site, to verify acceptability.
- B. Protect packaged adhesive from temperature cycling and cold temperatures.
- C. Do not store roll goods on end.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.
- B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

PART 2 PRODUCTS

2.01 WALL COVERINGS

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
- B. Custom Graphic Wall Covering (WC-#): Vinyl; digital printed:
 - 1. Basis of Design: Koroseal Type III Vinyl.
 - 2. Substrate: Satin White.
 - 3. Design: As indicated on drawings.

- C. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate.
- D. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.
- E. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work, and conform to requirements of the wall covering manufacturer.
- B. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet (3 mm in 3 m) nor vary at a rate greater than 1/16 inch/ft (1.5 mm/300 mm).

3.02 PREPARATION

- A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.
- B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.
- C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- D. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.
- E. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

- A. Apply adhesive and wall covering in accordance with manufacturer's instructions.
- B. Apply adhesive to wall surface immediately prior to application of wall covering.
- C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.
- D. Apply wall covering smooth, without wrinkles, gaps or overlaps. Eliminate air pockets and ensure full bond to substrate surface.
- E. Butt edges tightly.
- F. Horizontal seams are not acceptable.
- G. Do not seam within 2 inches (50 mm) of internal corners or within 6 inches (150 mm) of external corners.
- H. Install wall covering before installation of bases and items attached to or spaced slightly from wall surface.
- I. Do not install wall covering more than 1/4 inch (6 mm) below top of resilient base.
- J. Cover spaces above and below windows, above doors, in pattern sequence from roll.
- K. Remove excess adhesive while wet from seam before proceeding to next wall covering sheet. Wipe clean with dry cloth.

3.04 CLEANING

- A. Clean wall coverings of excess adhesive, dust, dirt, and other contaminants.
- B. Reinstall wall plates and accessories removed prior to work of this section.

3.05 PROTECTION

- A. Do not permit construction activities at or near finished wall covering areas.

END OF SECTION

SECTION 09 9113 - EXTERIOR PAINTING

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 unless noted otherwise including, but not limited to, the following.
 - 1. Exposed surfaces of steel lintels and ledge angles.
 - 2. Mechanical and Electrical:
 - a. Exterior mechanical and electrical: Paint all mechanical and electrical pipes, conduits, etc that penetrate exterior building walls, except as indicated below in paragraph D.
- 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. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
 - 6. Floors, unless specifically indicated.
 - 7. Glass.
 - 8. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 9123 - Interior Painting.
- C. Divisions 21 through 26: Identification for mechanical and electrical systems.

1.03 REFERENCE STANDARDS

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- D. SSPC-SP 2 - Hand Tool Cleaning; 2024.
- E. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.
- F. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color, sheen, type, sheen, surface texture, sheen, and sheen; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 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. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. Benjamin Moore & Co: www.benjaminmoore.com.
 - 2. Diamond Vogel Paints: www.diamondvogel.com.
 - 3. PPG Paints: www.ppgpaints.com.
 - 4. Pratt & Lambert Paints: www.prattandlambert.com.
 - 5. Sherwin-Williams Company: www.sherwin-williams.com.
- C. Primer Sealers: Same manufacturer as top coats.
- D. Substitutions: See Section 01 6000 - 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. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.
 - 2. Allow for minimum of six colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 3. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, primed wood, and primed metal.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
 - 3. Primer: As recommended by top coat manufacturer for specific substrate.
 - 4. Masonry: One coat of block filler as recommended by top coat manufacturer for specific substrate.

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. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 2. Exterior 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 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.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- G. Masonry:
 - 1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 - 2. Prepare surface as recommended by top coat manufacturer.
- H. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 - 2. Prepare surface according to SSPC-SP 2.
- I. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- J. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. 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.

END OF SECTION

SECTION 09 9123 - INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Elevator pit ladders.
 - 3. Prime surfaces to receive wall coverings.
 - 4. Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
 - c. Paint interior surfaces of air ducts and convactor and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
 - d. Paint dampers exposed behind louvers, grilles, and convactor and baseboard cabinets to match face panels.
- 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. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other tiles.
 - 8. Glass.
 - 9. Concrete masonry units in utility, mechanical, and electrical spaces.
 - 10. Acoustical materials, unless specifically indicated.
 - 11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09 9113 - Exterior Painting.
- C. Divisions 21 through 26: Identification for mechanical and electrical systems.

1.03 REFERENCE STANDARDS

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

- C. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- D. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.
- E. SSPC-SP 13/NACE No.6 - Surface Preparation of Concrete; 2018.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system 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 (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- E. Manufacturer's Instructions: Indicate special surface preparation procedures.
- F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Primer Sealers: Same manufacturer as top coats.
- C. Substitutions: See Section 01 6000 - Product Requirements.

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. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: See Section 01 6116.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors (PT-#): As indicated on drawings.
 - 1. Allow for minimum of six colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, wood, uncoated steel, shop primed steel, and galvanized steel.
 - 1. Two top coats and one coat primer.
 - 2. Top Coat(s): Interior Latex.
 - a. Basis of Design Products:

- 1) Benjamin Moore Ultra Spec 500.
- 2) Sherwin-Williams ProMar 200 Zero VOC.
3. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
 1. Medium duty applications include doors, door frames, railings, handrails, guardrails, and balustrades, unless noted otherwise.
 2. Two top coats and one coat primer.
 3. Top Coat(s): High Performance Architectural Interior.
 - a. Basis of Design Products:
 - 1) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
 - 2) Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)
 4. Primer: As recommended by top coat manufacturer for specific substrate.
- C. Paint I-OP-DF - Dry Fall: Metals; exposed structure and overhead-mounted services in utilitarian spaces, including shop primed steel deck, structural steel, metal fabrications, galvanized ducts, galvanized conduit, and galvanized piping.
 1. Shop primer by others.
 2. One top coat.
 3. Top Coat: Latex Dry Fall; MPI #118, 155, or 226.
 - a. Basis of Design Products:
 - 1) Sherwin-Williams Waterborne Acrylic Dryfall, Eg-Shel. (MPI #155, 226)
 4. Primer: As recommended by top coat manufacturer for specific substrate.

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. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. 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. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Concrete:
 - 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 2. Prepare surface as recommended by top coat manufacturer and in accordance with SSPC-SP 13/NACE No.6.
- G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- H. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- I. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.
- J. 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.
- K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. 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.

END OF SECTION

SECTION 09 9300 - STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Field application of stains.

1.02 RELATED REQUIREMENTS

- A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

- A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and catalog number, and general product category.
- C. Samples: Two samples on actual wood substrate to be finished, 4 by 4 inch (100 by 100 mm) in size, indicating selected colors and sheens for each system, with specified coats cascaded.
- D. Maintenance Data: Submit data including finish schedule showing where each product, color, and finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Extra Stock Materials: Stain and transparent finish materials, 1 gal (4 L) of each color and type; store where directed.
 - 3. Label each container with color and type in addition to the manufacturer's label.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with at least three years of experience.
- B. Applicator Qualifications: Company specializing in performing work of the type specified and with at least three years of experience.

1.06 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 stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.
- D. Minimum Application Temperature: 50 degrees F (10 degrees C) unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide finishes used in any individual system from the same manufacturer; no exceptions.
- B. Transparent Finishes:
 - 1. Behr Process Corporation: www.behr.com/#sle.
 - 2. PPG Paints: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- C. Stains:
 - 1. Behr Process Corporation: www.behr.com/#sle.
 - 2. PPG Paints: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
 - 1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content: See Section 01 6116.
- C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- D. Colors (ST-#): As indicated in Color Schedule.
 - 1. Color Schedule: See drawings for product information.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Finish on Wood - Vertical Surfaces:
 - 1. Stain: Semi-transparent stain for wood, solvent based.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of stains and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. 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. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

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. Reinstall items 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.

END OF SECTION

SECTION 10 1100 - VISUAL DISPLAY UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Porcelain enamel steel markerboards.
- B. Glass markerboards.
- C. Tackboards.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking and supports.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- C. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's data on chalkboard, porcelain enamel steel markerboard, glass markerboard, tackboard, tackboard surface covering, trim, and accessories.
- C. Shop Drawings: Indicate wall elevations, dimensions, joint locations , special anchor details.
- D. Samples: Submit two samples 2 by 2 inch (50 by 50 mm) in size illustrating materials and finish, color and texture of markerboard, tackboard, and trim.
- E. Manufacturer's printed installation instructions.
- F. Maintenance Data: Include data on regular cleaning, stain removal .

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year warranty for markerboard to include warranty against discoloration due to cleaning, crazing or cracking, and staining.

PART 2 PRODUCTS

2.01 VISUAL DISPLAY UNITS

- A. Markerboards (MRKBD-1): Porcelain enamel on steel, laminated to core.
 - 1. Basis of Design: As indicated on drawings.
- B. Magnetic Glass Markerboards (MRKBD-2):
 - 1. Basis of Design: As indicated on drawings.
 - 2. Glass: Laminated, low iron, 1/4 inch thick (6 mm thick), with bevel edges and radiused corners, laminated to steel backing sheet for use with magnets. Coated or treated for use as dry erase board or projection surface.
 - 3. Steel Backing Sheet Thickness: 24 gauge, 0.0239 inch (0.61 mm).

4. Mounting: Concealed Z clips.

2.02 MATERIALS

- A. Float Glass: Provide float-glass-based glazing unless otherwise indicated.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
- C. Adhesives: Type used by manufacturer.

2.03 ACCESSORIES

- A. Marker Tray on Porcelain Marker Boards: Aluminum, manufacturer's standard profile molded ends; concealed fasteners, same finish as frame.
- B. Mounting Brackets: Concealed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install boards in accordance with manufacturer's instructions.
- B. Secure units level and plumb.

3.03 CLEANING

- A. Clean board surfaces in accordance with manufacturer's instructions.
- B. Remove temporary protective cover at Date of Substantial Completion.

END OF SECTION

SECTION 10 1423 - PANEL SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Panel signage.

1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.
- C. Shop Drawings:
 - 1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
 - 2. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - c. Submit for approval by Owner through Architect prior to fabrication.
- D. Verification Samples: Submit samples showing colors, materials, and finishes specified.
- E. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store under cover and elevated above grade.
- D. Store tape adhesive at normal room temperature.

1.05 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain minimum ambient temperature during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Panel Signage:
 - 1. Best Sign Systems, Inc: www.bestsigns.com.
 - 2. Inpro Corporation: www.inprocorp.com.
 - 3. Mohawk Sign Systems, Inc: www.mohawksign.com.

4. Seton Identification Products: www.seton.com.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

- A. Panel Signage:
 1. Application: Room and door signs.
 2. Description: Flat signs with engraved panel media, tactile characters.
 3. Sign Size: As indicated on drawings.
 4. Color and Font, unless otherwise indicated:
 - a. Character Font: As indicated on drawings.
 - b. Character Case: Upper case only.
 - c. Background Color: As scheduled.
 - d. Character Color: Contrasting color.
 5. Material: Rigid Vinyl.
 6. Profile: Flat panel without frame.
 7. Tactile Letters: As indicated on drawings.
 8. Braille: Grade II, ADA-compliant.
 9. One-Sided Wall Mounting: Tape adhesive.
 10. Provide backer plates when indicated on drawings to be applied to glazing/sidelight.
- B. Flag Sign

2.04 SIGNAGE APPLICATIONS

- A. Room and Door Signs:
 1. Locations: as indicated on drawings schedule and plan.
 2. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
- B. Interior Directional and Informational Panel Signs:
 1. Provide new vinyl lettering as indicated on drawings for existing clear background directional signage.

2.05 ACCESSORIES

- A. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.
- B. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install with horizontal edges level.

- C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

END OF SECTION

SECTION 10 2113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Solid plastic toilet compartments.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking and supports.
- B. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

- A. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on panel construction, hardware, and accessories.
- C. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- D. Samples: Submit two samples of partition panels, 6 x 6 inch (152 x 152 mm) in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solid Plastic Toilet Compartments:
 - 1. All American Metal Corp - AAMCO: www.allamericanmetal.com.
 - 2. ASI Accurate Partitions: www.asi-accuratepartitions.com.
 - 3. ASI Global Partitions: www.asi-globalpartitions.com.
 - 4. Metpar Corp: www.metpar.com.
 - 5. Sanymetal Products Company: www.sanymetal.com.
 - 6. Scranton Products: www.scrantonproducts.com.
 - 7. Substitutions: Section 01 6000 - Product Requirements.

2.02 PLASTIC TOILET COMPARTMENTS

- A. Solid Plastic Toilet Compartments (COMP-1): Factory fabricated doors, pilasters, and divider panels made of solid molded high density polyethylene (HDPE), Class A, tested in accordance with NFPA 286; floor-mounted headrail-braced.
 - 1. Color: As indicated on drawings.
- B. Doors:
 - 1. Thickness: 1 inch (25 mm).
 - 2. Width: 24 inch (610 mm).
 - 3. Width for Handicapped Use: 36 inch (915 mm), out-swinging.
 - 4. Height: 55 inch (1397 mm).
- C. Panels:

1. Thickness: 1 inch (25 mm).
 2. Height: 55 inch (1397 mm).
 3. Depth: As indicated on drawings.
- D. Pilasters:
1. Thickness: 1 inch (25 mm).
 2. Width: As required to fit space; minimum 3 inch (76 mm).

2.03 ACCESSORIES

- A. Pilaster Shoes: Stainless steel, satin finish, 3 inches (76 mm) high; concealing floor fastenings.
1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Extruded aluminum, anti-grip profile.
1. Size: Manufacturer's standard size.
- C. Wall and Pilaster Brackets: Stainless steel; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hinges: Stainless steel, manufacturer's standard finish.
1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
- F. Door Hardware: Stainless steel, manufacturer's standard finish.
1. Door Latch: Slide type with exterior emergency access feature.
 2. Door Strike and Keeper with Rubber Bumper: Mount on pilaster in alignment with door latch.
- G. Coat Hook with Rubber Bumper: One per compartment, mounted on door.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch (9 mm to 13 mm) space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch (6 mm).
- B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

SECTION 10 2600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Corner guards.
- B. Protective wall covering.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.

1.03 REFERENCE STANDARDS

- A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010, with Editorial Revision (2015).
- B. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2023.
- E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
 - 1. Submit two sections of corner guards, 6 inches (152 mm) long.
- D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Stock Materials: One package(s) of minimum 96 inches (2438 mm) long unit of each kind of covers for corner guards.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Protect work from UV light damage.
- D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.
- E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

- B. Manufacturer Warranty: Provide 5-year manufacturer warranty for metal crash rails. Complete forms in Owner's name and register with manufacturer.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures or internal connection failures.
 - b. Deterioration of materials beyond that expected of normal use, as intended by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Corner Guards:
 - 1. Construction Specialties, Inc: www.c-sgroup.com.
 - 2. Inpro: www.inprocorp.com.
 - 3. Koroseal Interior Products: www.koroseal.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Protective Wall Covering:
 - 1. Construction Specialties, Inc: www.c-sgroup.com.
 - 2. Inpro: www.inprocorp.com.
 - 3. Panolam Surface Systems: www.panolam.com.
 - 4. Pawling Corp: www.pawling.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for compliance with applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance complying with applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.03 PRODUCT TYPES

- A. Corner Guards - Flush Mounted (CG-1):
 - 1. Basis of Design: Inpro.
 - 2. Material: High impact vinyl with full height extruded aluminum retainer; flush mount
 - 3. Performance: Impact strength of 30.2 ft-lbs/inch of thickness; as tested in accordance with ASTM D-256-90b.
 - 4. Width of Wings: 3 inches (76 mm).
 - 5. Corner: Square.
 - 6. Color: As indicated on drawings.
 - 7. Length: As indicated on drawings.
- B. Protective Wall Covering (WP-1):
 - 1. Basis of Design: Nevamar FRL by Panolam.
 - 2. Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free.
 - 3. Thickness: 0.060 inch (1.52 mm).
 - 4. Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 5. Color: As indicated on drawings.

- 6. Mounting: Adhesive.
- C. Adhesives and Primers: As recommended by manufacturer.
- D. See Section 06 1000 for wood blocking for wall and corner guard anchors.

2.04 FABRICATION

- A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
- D. Start of installation constitutes acceptance of project conditions.

3.02 INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position corner guard 4 inches (102 mm) above finished floor to ceiling.

3.03 TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch (6 mm).
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch (6 mm).

3.04 CLEANING

- A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.
- B. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION

SECTION 10 2641 - BALLISTICS RESISTANT PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Laminated fiberglass ballistics-resistant panels.
- B. Laminated aramid fiber ballistics-resistant panels.
- C. Laminated UHMWPE fiber ballistics-resistant panels.
- D. Steel ballistics-resistant panels.
- E. Aluminum ballistics-resistant panels.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood framing to receive ballistics-resistant panels.
- B. Section 06 4100 - Architectural Wood Casework: Casework to receive ballistics-resistant panels.
- C. Section 09 2116 - Gypsum Board Assemblies: Metal framing to receive ballistics-resistant panels.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- B. NIJ 0108.01 - Standard for Ballistic Resistant Protective Materials; 1985.
- C. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's current data sheets on each product to be used.
- C. Shop Drawings: Details of installation of ballistics-resistant panels, including plan views, elevations, sections, and details of the proposed installation with attachment methods.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Handle material with care to prevent damage. Stack panels flat, store inside under cover off the ground in a dry location, and protect from other construction activities.

1.07 FIELD CONDITIONS

- A. Install products under environmental conditions (temperature, humidity, and ventilation) recommended by manufacturer.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Laminated Glass Fiber Ballistics-Resistant Panels:
 - 1. ArmorCore by Waco Composites: www.armorcore.com.
 - 2. Armortex: www.armortex.com.
 - 3. Insulgard Security Products: www.insulgard.com.

4. Total Security Solutions: www.tssbulletproof.com.
5. U.S. Bullet Proofing: www.usbulletproofing.com/.
6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 LAMINATED FIBER BALLISTICS-RESISTANT PANELS

- A. General:
 1. Laminated fiber ballistics-resistant panels to be non-ricochet type. When struck by a bullet or projectile, the panels to delaminate in such a way that absorbs the energy, stops the projectile, and prevents ricochet or spalling.
- B. Performance Requirements:
 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when tested in accordance with ASTM E84.
- C. Laminated Fiber Panels:
 1. Material: Multiple layers of fiberglass woven roving bonded together with resin and compressed into flat rigid sheets.
 2. Attachment Method: Mechanical fasteners.
- D. Bullet Resistant Wall Panel (BAL PNL-1): Multi-ply laminated ballistic fiberglass. Tested in accordance with UL 752 and NIJ standards.
 1. Application: Provide in casework and walls where bullet resistant panel is indicated in the drawings.
 2. Thickness: 1/2 inch, nominal.
 3. Ballistic Protection: Level 3.
 4. Basis of Design: USFA 3 Fiberglass Wall Armor by U.S. Bullet Proofing: usbulletproofing.com.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verification of Conditions: Verify that substrates have been properly prepared.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation of this work.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Install panels in accordance with manufacturer's instructions and shop drawings and in proper relationship with adjacent construction.
 1. Maintain ballistics-resistive rating at panel junctures with concrete floor and roof slabs, bullet-resistive door and window frames, and required penetrations.
- B. Reinforce panel joints with a minimum 4 inch (102 mm) wide back-up layer of ballistics-resistant material, centered on panel joints.
- C. Secure panels using screws, bolts, or industrial adhesive.

3.04 PROTECTION

- A. Protect installed panels from subsequent construction operations.
- B. Touch-up, repair or replace damaged panels before Date of Substantial Completion.

END OF SECTION

SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Diaper changing stations.

1.02 RELATED REQUIREMENTS

- A. Section 10 2113.19 - Plastic Toilet Compartments.

1.03 REFERENCE STANDARDS

- A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2024.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- E. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.
- F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. American Specialties, Inc: www.americanspecialties.com.
 - 2. Bradley Corporation: www.bradleycorp.com.
 - 3. Bobrick Washroom Equipment Inc: www.bobrick.com.
 - 4. Substitutions: Section 01 6000 - Product Requirements.
- B. Provide products of each category type by single manufacturer.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
 - 1. Grind welded joints smooth.
 - 2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666/A666M, Type 304.
- C. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

- D. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- E. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.
- F. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Toilet Paper Dispenser (TP-2): Double roll, surface-mounted, stainless steel unit with pivot hinge.
 - 1. Basis of Design: Model 5234 manufactured by Bradley.
- B. Paper Towel Dispenser (PTD-1): Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.
 - 1. Basis of Design: Model 250-15 manufactured by Bradley.
 - 2. Capacity: 500 multifold minimum.
- C. Combo Paper Towel and Waste Container (COMB-1): Satin stainless steel; semi-recessed.
 - 1. Basis of Design: Model 2252-10 manufactured by Bradley.
- D. Soap Dispenser (SP-1): Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.
 - 1. Basis of Design: Model 6562 manufactured by Bradley.
 - 2. Minimum Capacity: 40 ounces (1.2 liters).
- E. Framed Mirrors (MIR-10): Stainless steel framed, 6 mm thick tempered glass mirror.
 - 1. Basis of Design: 780 Series manufactured by Bradley.
 - 2. Size: As indicated on drawings.
 - 3. Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
- F. Grab Bars: Stainless steel.
 - 1. Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
 - b. Dimensions: 1-1/2 inch (38 mm) outside diameter, minimum 0.05 inch (1.3 mm) wall thickness, concealed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
 - c. Finish: Satin.
 - d. Length and Configuration (see drawings for which of the following are used):
 - 1) (GB-18): 18 inches. Basis of Design 812 Series by Bradley.
 - 2) (GB-36): 36 inches. Basis of Design 812 Series by Bradley.
 - 3) (GB-42): 42 inches. Basis of Design 812 Series by Bradley.
- G. Sanitary Napkin Disposal Unit (ND-1): Stainless steel, surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
 - 1. Basis of Design: Model 4781-11 manufactured by Bradley.
- H. Coat Hook (HK-1): Stainless steel, 3 inch (75 mm) extension from wall; rectangular-shaped bracket and backplate for concealed attachment, satin finish.
 - 1. Basis of Design: Model 9134 manufactured by Bradley.

2.05 DIAPER CHANGING STATIONS

- A. Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Basis of Design (BCS-2): Model 962-11 manufactured by Bradley.
 - 2. Material: Stainless steel.
 - 3. Mounting: Surface.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 06 1000 for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire blankets.
- C. Fire extinguisher cabinets.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; Current Edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, and anchorage details.
- C. Shop Drawings: Indicate locations of cabinets, cabinet physical dimensions, and rough-in measurements for recessed cabinets.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Extinguishers:
 - 1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com.
 - 2. Ansul, a Tyco Business: www.ansul.com.
 - 3. Kidde, a unit of United Technologies Corp: www.kidde.com.
 - 4. Pyro-Chem, a Tyco Business: www.pyrochem.com.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Fire Extinguisher Cabinets and Accessories:
 - 1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com.
 - 2. Larsen's Manufacturing Co: www.larsensmfg.com.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Provide one fire extinguisher for each cabinet or bracket indicated on the drawings.
 - 2. Basis of Design: Cosmic by JL Industries.
 - 3. Class: A:B:C type.
 - 4. Size: 10 pound (4.54 kg).
 - 5. Finish: Baked polyester powder coat color as selected.
 - 6. Temperature range: Minus 40 degrees F (Minus 40 degrees C) to 120 degrees F (49 degrees C).
- C. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
 - 1. Class: K type.
 - 2. Temperature range: Minus 20 degrees F (Minus 29 degrees C) to 120 degrees F (49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

- A. Fire-Rated Construction: Provide fire-rated cabinets in fire-rated walls (see drawings for locations).
- B. Cabinet Configuration (FCAB-1): Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Basis of Design: JL Industries "Ambassador Series" sized for 10 lb fire extinguisher.
 - 3. Projected Trim: Returned to wall surface, with 2-1/2 inch (63 mm) projection, and 1-3/4 inch (44 mm) wide face.
 - 4. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.
- C. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinges.
- D. Door Glazing: Float glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.
- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Fabrication: Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.
- H. Finish of Cabinet Interior: White colored enamel.

2.04 ACCESSORIES

- A. Fire Blanket (FBLK-1): Fire retardant treated wool; red, 62 by 84 inch (1575 by 2135 mm) size.
- B. Extinguisher Brackets (FBRKT-1): Formed steel, chrome-plated.
- C. Lettering: "FIRE EXTINGUISHER" decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

- B. Secure rigidly in place.
- C. Place extinguishers in cabinets.

END OF SECTION

SECTION 12 2400 - WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior manual roller shades.
- B. Interior motorized roller shades.
- C. Motor controls.

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.
- C. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week prior to commencing work related to products of this section; require attendance of affected installers.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
- C. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
- D. Verification Samples: Minimum size 6 inches (150 mm) square, representing actual materials, color and pattern.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.
- G. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
- B. Handle and store shades in accordance with manufacturer's recommendations.

1.06 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.07 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
 - 1. Shade Hardware: One year.
 - 2. Fabric: One year.

3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Interior Manually Operated Roller Shades:
 1. Draper, Inc: www.draperinc.com.
 2. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com.
 3. MechoShade Systems LLC: www.mechoshade.com.
 4. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Interior Motorized Roller Shades, Motors and Motor Controls:
 1. Draper, Inc: www.draperinc.com.
 2. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com.
 3. MechoShade Systems LLC: www.mechoshade.com.
 4. SWFcontract, a division of Springs Window Fashions, LLC: www.swfcontract.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROLLER SHADES

- A. General:
 1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
 2. Provide shade system that operates smoothly when shades are raised or lowered.
 3. Motorized Shades: Motor system housed inside roller tube, controlling shade movement via motor controls indicated; listed or recognized to UL 325.
 - a. Comply with NFPA 70.
 - b. Electrical Components: Listed, classified, and labeled as suitable for the purpose intended. Where applicable, system components to be FCC compliant.
 - c. Motors: Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated; integrated into shade operating components and concealed from view; fully compatible with controls to be installed.
- B. Roller Shades (WT-1) - Basis of Design: As indicated on drawings; to match existing.
 1. Description: Single roller, manually operated fabric window shades.
 - a. Drop Position: Regular roll.
 - b. Mounting: Window jamb mounted.
 - c. Size: As indicated on drawings.
 - d. Fabric: As indicated under Shade Fabric article.
 2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
 - a. Material: Steel, 1/8 inch (3 mm) thick.
 3. Roller Tubes:
 - a. Material: Extruded aluminum.
 - b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
 - c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge. Shade band to be removable and replaceable without removing roller tube from brackets or inserting spline from the side of the roller tube.

- d. Capable of being removed and reinstalled without affecting roller shade limit adjustments.
- 4. Hembars: Designed to maintain bottom of shade straight and flat.
 - a. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 - b. Room-Darkening Shades: Provide a slot in bottom bar with wool-pile light seal.
- 5. Clutch Operator: Manufacturer's standard material and design integrated with bracket/brake assembly.
 - a. Provide a permanently lubricated brake assembly mounted on an oil-impregnated hub with wrapped spring clutch.
 - b. Brake must withstand minimum pull force of 50 lb (22.7 kg) in the stopped position.
 - c. Mount clutch/brake assembly on the support brackets, fully independent of the roller tube components.
- 6. Drive Chain: Continuous loop stainless steel beaded ball chain, 95 lb (43 kg) minimum breaking strength. Provide upper and lower limit stops.
 - a. Chain Retainer: Chain tensioning device complying with WCMA A100.1.
- 7. Accessories:
 - a. Fascia: Extruded aluminum, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; fabric wrapped finish to match shade.
- C. Roller Shades (WT-2) - Basis of Design: As indicated on drawings; to match existing.
 - 1. Description: Single roller, motor-operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
 - a. Mounting: Window jamb mounted.
 - b. Size: As indicated on drawings.
 - c. Fabric: As indicated under Shade Fabric article.
 - d. Material: Steel, 1/8 inch (3 mm) thick.
 - e. Style: Full wrap fabric covered bottom bar, flat profile with heat sealed closed ends.
 - f. Room-Darkening Shades: Provide a slot in bottom bar with wool-pile light seal.
 - 1) Audible Noise: 38 dBA or less measured 3 feet from motor unit, depending on motor torque.
 - 2) Capable of being configured to place motor into Override Mode when local switch commands shade to new position. Upon entering Override Mode, monitor and log positioning commands from automation devices, but do not act upon them until exiting Override Mode.
 - 3) Preventative Maintenance: Internally monitor important operating parameters to ensure motor and shade assembly are functioning properly.
 - 4) Uniform Mode: Shades move only to defined intermediate stop positions to maintain aesthetic uniformity.
 - 5) Normal Mode: Shades move to defined intermediate stop positions plus any position between defined upper and lower limits.
 - 6) Maintenance Mode: Prevent shade from moving to newly commanded positions via dry contact or network control commands until EDU has been serviced or Maintenance Mode has been cleared or disabled.
 - g. Control Methods:
 - 1) Local isolated dry contact inputs support local switch control and third-party system integration without separate interface.

- 2) Bidirectional network communication enables commanding operation of large groups of shades over common backbone.
 - 3) Provide minimum of three customizable preset positions accessible over network connection and local dry contact control inputs.
 - 4) Provide minimum of 32 customizable preset positions, including three local switch presets, accessible via network commands.
2. Accessories:
 - a. Fascia: Removable extruded aluminum fascia, size as required to conceal shade mounting, attachable to brackets without exposed fasteners; finish: as indicated on drawings.

2.03 SHADE FABRIC

- A. Fabric: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
 1. Basis of Design:
 - a. MechoShade Systems LLC: www.mechoshade.com.
 - b. SWFcontract Commercial Shades: www.swfcontract.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.04 MOTOR CONTROLS

- A. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- B. Provide all components and connections necessary to interface with other systems as indicated.
- C. Manual Controls:
 1. Control Functions:
 - a. Open: Automatically open controlled shade(s) to fully open position when button is pressed.
 - b. Close: Automatically close controlled shade(s) to fully closed position when button is pressed.
 - c. Multiple Shade Groups: Provide individual controls for each shade group as indicated.
 2. Wall Controls: Provided by shade manufacturer.
 - a. Finish: To be selected by Architect.
 - b. Button Engraving: Manufacturer's standard engraving, unless otherwise indicated.

2.05 ROLLER SHADE FABRICATION

- A. Field measure finished openings prior to ordering or fabrication.
- B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
 1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch (13 mm) space between bottom bar and window stool.
 2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb.
- C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine finished openings for deficiencies that may preclude satisfactory installation.
- B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

- A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
- B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.
- B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 SYSTEM STARTUP

- A. Motorized Shade System: Provide services of a manufacturer's authorized representative to perform system startup.

3.05 CLEANING

- A. Clean soiled shades and exposed components as recommended by manufacturer.
- B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.
- C. Training: Train Owner's personnel on operation and maintenance of system.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours training by manufacturer's authorized personnel at location designated by the Owner.

3.07 PROTECTION

- A. Protect installed products from subsequent construction operations.
- B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 3600 - COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Countertops for architectural cabinet work.

1.02 RELATED REQUIREMENTS

- A. Division 22 - Plumbing fixtures, sinks.

1.03 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
- D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- F. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Installation Instructions: Manufacturer's installation instructions and recommendations.
- F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

- B. Plastic Laminate Countertops (PLAM-#): High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - 1. Basis of Design: See drawings for product information.
 - 2. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch (1.2 mm) nominal thickness.
 - a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - b. Finish: Matte or suede, gloss rating of 5 to 20.
 - 3. Exposed Edge Treatment: Molded rubber edge sized to completely cover edge of panel.
 - 4. Back and End Splashes: Same material, same construction.
 - a. Provide where indicated on the Drawings.
 - 5. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade.
- C. Solid Surfacing Countertops (SSM-#): Solid surfacing sheet or plastic resin casting over continuous substrate.
 - 1. Basis of Design: See drawings for product information.
 - 2. Flat Sheet Thickness: 1/2 inch (12 mm), minimum.
 - 3. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - 4. Other Components Thickness: 1/2 inch (12 mm), minimum.
 - 5. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.

2.02 MATERIALS

- A. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
 - 2. Provide sustainably harvested wood, certified or labeled; see Section 01 6000 - Product Requirements.
- B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
- C. Countertop Support Members: Furniture grade, epoxy powder coated steel.
 - 1. Basis of Design: Rakks Model EH-1818FM with cover bracket as manufactured by Rangine Corporation or approved equal.
- D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches (102 mm), unless otherwise indicated.
 - 3. Detail top of backsplash to allow scribing of backsplash to wall.
- C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch (16 mm).
- C. Attach countertops using compatible adhesive as well as mechanical fasteners.
- D. Seal joint between back/end splashes and vertical surfaces.

3.04 CLEANING

- A. Clean countertops surfaces thoroughly.

3.05 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 21 0500 - FIRE PROTECTION GENERAL PROVISIONS

PART 1 GENERAL

1.01 SUMMARY

A. Specification Format

1. These Specifications are written in imperative and abbreviated form. This imperative language of the technical sections is directed at the Contractors, unless specifically noted otherwise.
Incomplete sentences shall be completed by inserting "shall", "the Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, perform all indicated requirements whether stated imperatively or otherwise.
2. Three Part Format
 - a. "Part 1 - General": Covers those areas which relate to the Work, and which define the general administrative and technical requirements specific to a particular section.
 - b. "Part 2 - Products": Defines, in detail, the acceptance equipment and materials to be incorporated into the Work.
 - c. "Part 3 - Execution": Describes, in detail, the manner in which items covered by Part 2 are to be incorporated into the Work.
3. Where Codes, Specifications and Drawings are in conflict, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies immediately to the Engineer prior to commencing related work.

B. Definitions

1. Furnish: Supply equipment as required by these Drawings and Specifications, delivered to the job site for installation or use by others.
2. Install: Fix in position for total operational use all apparatus as shown, specified or required. Provide all miscellaneous fittings and wiring supplies.
3. Or Approved Equal: Equipment or materials selected by Contractor subject to Engineer's acceptance.
4. Or Equivalent: Equipment or materials selected by Contractor matching the function and performance of equipment or materials listed.
5. Provide: Furnish and install in place, total and operational.
6. Complete/Completely: All pipes, fittings, ducts, wiring supplies, and accessories provided for the noted equipment from the equipment to the mains or noted termination points.

1.02 NOMENCLATURE

- A. NICET: National Institute for Certification in Engineering Technologies.
- B. Pipe sizes listed are nominal pipe sizes throughout this Division except where otherwise noted.

1.03 SCOPE OF WORK

- A. The work covered by this Division consists in furnishing all labor, equipment, accessories and materials and in performing all operations necessary for the expansion and modification of the existing fire protection systems, in strict accordance with Division 21 of this Specification and applicable Drawings and subject to the terms and conditions of the Contract.

- B. Work of this Division is subject to requirements of Instructions to Bidders, General Conditions, Supplementary Conditions, Division One, and all other sections of this Specification.
- C. Examine site and all Contract documents prior to submittal of bid.
 - 1. Submittal of a Bid shall indicate the Contractor has examined the Site and Drawings and has included all required allowances in this Bid. No allowance shall be made for errors resulting from the Contractor's failure to visit job sites and to review Drawings.
- D. Division 21 Work: Includes the following system types:
 - 1. Wet-Pipe Sprinkler System.
- E. Delegated-Design: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data by a NICET Level III certified designer or licensed Professional Engineer responsible for their preparation.
 - 1. Everything necessary for the complete and successful operation of this system, whether or not definitely specified on the Drawings shall be furnished and installed as if specified or indicated.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design system for Class A, B, and C fires as appropriate for areas being protected, and include safety factor.
- B. Fire-extinguishing system design shall be approved by authorities having jurisdiction and shall be in accordance to architectural drawings and code plans.

1.05 WORK BY OTHERS

- A. Painting.
- B. Wiring by Division 26.

1.06 ALTERNATES

- A. Refer to Division 01 for Alternates.

1.07 CONTINGENCY

- A. Refer to Division 01 for amount to include .

1.08 SUBMITTALS

- A. General:
 - 1. Preferred Submittal Format: PDF, unless otherwise noted.
 - 2. Preferred Submittal Nomenclature: Unless otherwise noted, PDF submittals are to be named according to the following:
 - a. [Specification Section Number] – [Specification Name or Equipment Included]
 - 3. Distribution: Unless otherwise noted, direct all correspondence concerning Division 21 submittals to:
 - a. Caleb Bulow
 - b. PRAIRIE ENGINEERING, P.C.
 - c. 1905 17TH STREET SE
 - d. MINOT, ND 58701
 - e. cbulow@prairieengineeringpc.com
- B. Substitution and Prior Approval to Quote.
 - 1. Format and Content: Complete descriptive technical data on the proposed item consisting of model numbers, type, size and performance characteristics.
 - 2. Submission Timing: Minimum of 192 hours (eight days) prior to bid opening.

- a. Substitutions will not be permitted after bid opening except where such substitution is considered by the Engineer to be in the best interest of the Owner.
- 3. Bidder Notification: Prior to bid opening via Addenda, sent to all planholders.
- 4. Contractor Responsibility: This contractor will be responsible for all coordination, construction costs, and Architectural/Engineering design fees required to substitute equipment that has different characteristics than designed including weights, physical dimensions, clearances, mechanical characteristics, electrical characteristics, and other characteristics deemed important to the design by the Architect/Engineer.
- 5. Alternative Format: Printed paper, two copies; Self-addressed, stamped envelope required for return reply.
- C. Shop Drawings: Submit to Engineer via the Prime Contractor for each item indicated.
 - 1. Format and Content: Include catalog numbers, performance data, dimensions and other descriptive information.
 - 2. Contractor Review: Dated and signed cover sheet or review stamp for each Shop Drawing file to indicate thorough review. Email message text not acceptable.
 - 3. Non-Conforming: Returned to Contractor without review.
 - 4. Submission Timing: Prior to delivery of materials to job site.
- D. Shop Drawings, Wet-pipe Sprinkler Systems:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
 - 3. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
- E. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- F. Record Drawings
 - 1. Format and Content: Paper copy of Drawings project site.
 - a. As work progresses, Contractor's field supervisor shall mark Record Drawings in red pencil to indicate actual conditions of installation.
 - b. Give particular attention to marking actual locations of underground piping.
 - c. Affix all addendum and change order descriptions to appropriate record drawing sheet, utilizing spray adhesive.
 - d. Make Record Drawings available to Engineer during project visitation.
 - 2. Submission Timing: Close of project with Record Manuals.
- G. Spare Equipment and Devices
 - 1. Distribution: Owner.
 - 2. Format and Content: List quantities on contractor letterhead or invoice, obtain signature of Owner's representative acknowledging receipt, and include with each Record Manual.
 - 3. Submission Timing: Close of project with Record Manuals.
- H. Operation and Maintenance Manuals
 - 1. Submission Timing: Close of project, as condition of its acceptance.
 - 2. Record Manual information shall be included for all equipment/material where Shop Drawings are required.
 - 3. Format and Content: Two copies, Loose-leaf hardcover binders, and in PDF format on CDs.

- a. List project name, date, Contractor's name, address and telephone number on exterior label of each Record Manual and CD or USB drive.
- b. Include an index sheet indicating subcontractor and subcontractor's phone number and each major piece of equipment, supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
- c. Include a copy of the Shop Drawings.
- d. Include all installation, operation and maintenance data packaged with any equipment.
- e. Include all signed and dated final punch lists from walkthroughs performed by the Engineer.

1.09 APPLICATIONS FOR PAYMENT

- A. Refer to Division 1 "Applications for Payment".
- B. Provide one additional copy, sent directly to the Engineer.
- C. Schedule of Values: At minimum, include items in Submittal article.

1.10 AUTHORITIES AND AGENCIES

- A. All work will be installed for the approval and acceptance of the following:
 - 1. Insurance Services Office
 - 2. State Fire Marshall
 - 3. Local Fire Inspection Office
- B. Any permits for the installation or construction of any of the work included in this section, which are required by any of the Authorities or Agencies having jurisdiction, shall be obtained and paid for by the Fire Protection Contractor.
- C. All inspections, examinations and tests of any of the work included in this section, which are required by any of the Authorities or Agencies having jurisdiction, shall be obtained and paid for by the Fire Protection Contractor.

1.11 QUALITY ASSURANCE

- A. Qualifications of Installers
 - 1. For installation and testing, use only trained licensed and experienced workmen familiar with items required and manufacturer's recommended methods.
 - 2. In acceptance or rejection of installed work, no allowance will be made for lack of skill on the part of the workmen.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.12 WARRANTY

- A. The entire Fire Protection installation, as specified under this Section of the Specifications, shall be guaranteed for one (1) year against defective equipment, materials and workmanship. The liability of the Fire Protection Contractor under this guarantee is limited to repair or replacement of fire protection defective equipment, materials or workmanship. The guarantee period is to begin on the date the equipment is placed in operation at the Owner's request for his convenience or from the date a successful acceptance test is made, whichever occurs first.
- B. The guarantee shall not be construed as requiring the Fire Protection Contractor to render service or maintenance required in the normal operation of the equipment or to make repairs that may be needed due to normal wear and tear or the Owner's negligence, abuse or breakage.

1.13 TEMPORARY FACILITIES

- A. Refer to Special Conditions and/or Division 1 for details of temporary facilities.

PART 2 PRODUCTS

2.01 MATERIAL

- A. All material, equipment, valves and devices, installed or furnished under this Section, shall be listed or approved for use in the Fire Protection installation by the Authorities, Agencies, Codes and Standards named in this Section of the Specification.
 - 1. Underwriter's Laboratories - Approved Fire Protection Equipment List
 - 2. Factory Mutual Approved Equipment Manual
- B. Material and equipment shall be as shown or specified. Provide material not specifically described but required for a complete and proper installation of the Work, subject to the acceptance of the Engineer.
- C. Owner will not be liable for material installed in non-compliance with codes, standards, and these Contract Documents.
- D. Fire Stop System material shall be by 3M "Fire Barrier", Metacaulk, Hilti, Nelson Firestop Products, or AD Fire.
- E. See Division 07 for further details on approved materials.

2.02 ELECTRIC WIRING

- A. The Division 21 Contractor shall furnish and install all water flow switches, air pressure switches and alarms, valve supervisory switches, visual/audible alarms, fire pump and controller, control panels, pre-action detection devices, air compressor and controls, special controls and electrical devices as specified herein for proper operation of the equipment furnished.
- B. The Division 23 Contractor shall furnish and install all ventilation equipment and dampers, unless otherwise noted in the Drawings or Specifications.
- C. Division 26 Contractor shall furnish and install, as required, wiring to supervisory switches, flow switches and alarms; and power wiring to fire pump and controller; furnished separately by Division 21 Contractor, unless otherwise noted in Equipment Specifications.
 - 1. Clean Agent Fire Extinguishing System and Preaction Sprinkler System: Division 26 Contractor shall furnish and install, as required, 120 volt wiring to control panels, and interface wiring for equipment shut down.

PART 3 EXECUTION

3.01 GENERAL

- A. Engineer, Architect, or Owner shall not be responsible for the means, methods, techniques, sequences or procedures of construction selected by Contractor.
- B. Engineer, Architect, or Owner shall not be responsible for safety precautions and programs incidental to work of Contractor.
- C. It is the sole responsibility of Contractor to initiate, maintain, and supervise all safety precautions and programs in connection with the Work.
- D. In general, it is intended that piping be installed parallel to building lines, unless otherwise shown on the Drawings, and that equipment be located symmetrical with the architectural elements of the building.
- E. Install piping above grid ceilings to allow easy removal of ceiling tiles. Install exposed piping as high as possible except where noted otherwise.

3.02 SURFACE CONDITIONS

- A. Prior to work, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this Division may be installed in accordance with all pertinent codes, regulations and standards.

3.03 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Division before, during and after installation and to protect the installed work and materials of all other trades.
- B. Plugs: Install in ends of uncompleted piping at end of each day or when work stops.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

3.04 COORDINATION

- A. Order equipment and material in a timely fashion to assure it is on the job site when required.
- B. Coordinate installation of material with schedule of other trades to prevent unnecessary delay in construction schedule.
- C. Coordinate pipe routing with other trades to avoid conflicts with ductwork and other piping system.
- D. Division 21 piping and equipment installations shall comply with National Electrical Code requirements 110.26 "working spaces" and "dedicated spaces". Pipes shall not be installed in the space near electrical panels/equipment defined as "working spaces" or "dedicated spaces".

3.05 DISCREPANCIES, CONSTRUCTION CONFLICTS AND DRAWINGS

- A. Discrepancies
 - 1. Prior to submitting bid, Contractor shall refer any apparent discrepancies or omissions to Engineer for clarification.
 - 2. The Architect, Engineer or Owner will not be responsible for any oral instructions or modifications to the contract documents prior to opening of bids.
 - 3. Written interpretation or clarification will be made by Addenda.
- B. Construction Conflicts
 - 1. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision.
 - 2. Do not proceed with installation in area of question until conflict has been fully resolved.
 - 3. When so directed by Engineer, Contractor shall make minor adjustment to avoid interferences with other trades. Such minor adjustments shall be performed at no additional cost to the Architect, Engineer or Owner.
- C. Drawings
 - 1. Refer to the architectural drawings for dimensions and locations of walls, partitions, doors, windows, ceiling heights, door swings and other details of construction.

3.06 CUTTING AND PATCHING

- A. Refer to General Conditions. Unless specifically called out to be performed by other Contractors, the Division 21 Contractor shall perform all cutting and patching required for the installation of material and equipment furnished under his Contract.
- B. Opening/holes cut to allow passage of pipes through concrete floor shall be patched by the Contractor doing the cutting unless indicated otherwise on the Drawings.

- C. Fire-Barrier Penetrations
 - 1. Pipe penetrations through fire rated walls and floors shall be sealed with a UL classified Fire Stop System. Fire Stops shall be provided in accordance with the appropriate System No. as it relates to pipe size/Material and wall or floor rating/material.
 - 2. See Specification Section 210510 for other Fire-Barrier Penetration requirements.
 - 3. See Section 2 article "Materials" of this Specification for approved fire stop system material.
- D. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all cost.
- E. Use only rotary type drilling tools to cut concrete.
- F. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.07 FIELD QUALITY CONTROL

- A. Perform field tests and inspections. Test new piping and parts of existing piping that have been altered, extended, or repaired.
- B. Ceiling Inspection: An above ceiling inspection by the Architect/Engineer shall take place prior to the installation of the ceiling, to ensure that everything is properly sealed, accessible, and fire sealed if required.
- C. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained. Piping will be considered defective if it does not pass tests and inspections.

3.08 INSTRUCTIONS

- A. Provide written and oral operating and maintenance instructions to Owner's representatives. The oral instructions shall be given before the Owner occupies the buildings. Written instructions shall be graphical insofar as practical.
- B. Division 21 Contractor shall coordinate with Owner at Owner's convenience, formal instruction time for contractor personnel to instruct Owner's Representatives on all equipment.

END OF SECTION

SECTION 21 0510 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Escutcheons.
- C. Fire rated enclosures.
- D. Pipe hangers and supports.
- E. Pipe sleeves.

1.02 REFERENCE STANDARDS

- A. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023, with Errata (2024).
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- D. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- E. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
- F. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- G. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- H. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- I. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.
- J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- L. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.
- M. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.
- N. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
- O. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.
- P. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 210500 Fire Protection General Provisions for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.
- D. Installer's qualification statement.
- E. Project Record Documents: Record actual locations of components and tag numbering.
- F. Operation and Maintenance Data: Include installation instructions and spare parts lists.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Sprinkler-based System:
 - 1. Comply with NFPA 13.
 - 2. See Section 21 1300.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 40, black.
 - 1. Steel Fittings: ASME B16.5 steel flanges and fittings.
 - 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
 - 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
 - 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - 5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), H58 drawn.
 - 1. Fittings: ASME B16.18, cast copper alloy, grooved.
 - 2. Mechanical Grooved Couplings: Ductile iron housing with alkyd enamel paint coating clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers.
- C. Ductile Iron Pipe: AWWA C151/A21.51.
 - 1. Fittings: AWWA C110/A21.10, standard thickness.
 - 2. Joints: AWWA C111/A21.11, SBR or vulcanized styrene-butadiene rubber gasket.
 - 3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 PIPE SLEEVES

- A. Vertical Piping:
 - 1. Sleeve Length: 1 inch above finished floor.
 - 2. Provide sealant for watertight joint.
- B. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Clearances:
 - 1. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
 - 2. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.04 FIRE-RATED ENCLOSURES

- A. Provide as required to preserve fire resistance rating of building elements.

2.05 ESCUTCHEONS

- A. Material:
 - 1. Chrome-plated.
 - 2. Metals and Finish: Comply with ASME A112.18.1.
- B. Construction:

1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.06 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- H. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 2. Place hangers within 12 inches of each horizontal elbow.
 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 6. Provide copper plated hangers and supports for copper piping.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
- J. Escutcheons:
 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.03 CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

1.02 SUBMITTALS

- A. See Section 210500 Fire Protection General Provisions for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
- D. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
 - 2. Sprinkler Wrenches: For each sprinkler type.
- F. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.03 QUALITY ASSURANCE

- A. Comply with FM (AG) requirements.
- B. Designer Qualifications: Certified NICET Level III, or design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in North Dakota.
- C. Installer Qualifications: Company specializing in performing the work of this section with minimum of 2 years experience in the successful installation and operation of Fire Protection systems.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - 1. Anvil International: www.anvilintl.com/#sle.
 - 2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
 - 3. Viking Corporation: www.vikinggroupinc.com/#sle.

2.02 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Determined by Designer.
- C. Water Supply: Determine volume and pressure from water flow test data.
 - 1. If test data is not available, coordinate with local utility and obtain prior to bidding.
- D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

2.03 SPRINKLERS

- A. Finished Ceiling Type:
 - 1. Flush concealed sprinklers: Rough brass with white cover plate.
- B. Exposed Type:
 - 1. Finished Spaces: Chrome plated pendent or sidewall.
 - 2. Unfinished Spaces: Rough bronze pendent or sidewall.
- C. Flexible Drop System: Stainless steel, multiple use, open gate type.
 - 1. Application: Use to properly locate sprinkler heads.
 - 2. Include all supports and bracing.
 - 3. Provide braided type tube as required for the application.
 - 4. Manufacturers: Subject to compliance with requirements, provide products by one of the following or other prior approved:
 - a. FlexHead Industries, a brand of Anvil International
 - b. Easyflex.
 - c. Victaulic Company; Vic-Flex
 - d. Rascoflex.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- F. Flush new piping system of foreign matter.
- G. Hydrostatically test entire system.
- H. Require test be witnessed by Authority Having Jurisdiction.
- I. Install sleeves for piping penetrations of walls, ceilings, and floors.
- J. Install escutcheons for exposed piping penetrations of walls, ceilings, and floors.

3.02 FLEXIBLE SPRINKLER HOSE INSTALLATION

- A. Install flexible sprinkler hose connections to heads in all areas with a finished suspended or sheetrock ceiling.
 - 1. Exceptions: Where limited space is a factor and minimum bend radius is not possible. Verify these locations with design engineer and indicate them on the Fire Sprinkler Shop Drawings.
- B. Mount heads to bracket system manufactured by same manufacturer as flexible connector drops.

- C. Do not over-bend flexible hose. Do not exceed manufacturer recommended minimum radius.

3.03 FIELD QUALITY CONTROL

- A. Fire Sprinkler Service Piping Tests: Test service piping as required by the Authority Having Jurisdiction or, in absence of published procedures, as follows:
 - 1. Witness: Test shall be performed in the presence of the Authority Having Jurisdiction or the representative of the Owner.
 - 2. Testing: Before the joints are covered in order for leaks to be detected.
 - 3. Pressure: Minimum of 200 psig, if maximum static pressure is 150 psig or greater the pressure test shall be 50 psig greater than maximum pressure test.
 - 4. Duration: Two (2) hours.
 - 5. Leakage Rate: Not to exceed two quarts/hr per 100 joints or gaskets irrespective of pipe diameter. Leakage for metal seated valves may increase above leakage rate by one fluid ounce per inch valve diameter per hour for each metal seated valve isolating the test section.
 - 6. Control Valves: Operating test shall be performed on all control valves when system is under full pressure to ensure proper operation.
 - 7. Certification: Upon completion, this Contractor shall complete the "Contractor's Material & Test Certificate For Underground Piping" contained in NFPA 2 and submit copies to the Owner, Engineer, Local Fire Chief and ISO Commercial Risk Services, Inc.
 - 8. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 9. Flush, test, and inspect sprinkler systems according to NFPA 13, "System Acceptance" Chapter.
 - 10. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
 - 11. Energize circuits to electrical equipment and devices.
 - 12. Coordinate with fire-alarm tests. Operate as required.
 - 13. Coordinate with fire-pump tests. Operate as required.
- B. Verify that equipment hose threads are same as local fire-department equipment.

END OF SECTION

SECTION 22 0500 - PLUMBING GENERAL PROVISIONS

PART 1 GENERAL

1.01 SUMMARY

A. Specification Format

1. These Specifications are written in imperative and abbreviated form. This imperative language of the technical sections is directed at the Contractors, unless specifically noted otherwise.
Incomplete sentences shall be completed by inserting "shall", "the Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, perform all indicated requirements whether stated imperatively or otherwise.
2. Three Part Format
 - a. "Part 1 - General": Covers those areas which relate to the Work, and which define the general administrative and technical requirements specific to a particular section.
 - b. "Part 2 - Products": Defines, in detail, the acceptance equipment and materials to be incorporated into the Work.
 - c. "Part 3 - Execution": Describes, in detail, the manner in which items covered by Part 2 are to be incorporated into the Work.
3. Where Codes, Specifications and Drawings are in conflict, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies immediately to the Engineer prior to commencing related work.

B. Definitions:

1. **Furnish:** Supply equipment as required by these Drawings and Specifications, delivered to the job site for installation or use by others.
2. **Install:** Fix in position for total operational use all apparatus as shown, specified or required. Provide all miscellaneous fittings and wiring supplies.
3. **Or Approved Equal:** Equipment or materials selected by Contractor subject to Engineer's acceptance.
4. **Or Equivalent:** Equipment or materials selected by Contractor matching the function and performance of equipment or materials listed.
5. **Provide:** Furnish and install in place, total and operational.
6. **Complete/Completely:** All pipes, fittings, wiring supplies, and accessories provided for the noted equipment from the equipment to the mains or noted termination points.

1.02 SCOPE OF WORK

- A. The work covered by this Division consists in furnishing all labor, equipment, accessories and materials and in performing all operations necessary for the installation of the plumbing systems, in strict accordance with Division 22 of this Specification and applicable Drawings and subject to the terms and conditions of the Contract.
- B. Work of this Division is subject to requirements of Instructions to Bidders, General Conditions, Supplementary Conditions, Division One, and all other sections of this Specification.
- C. Examine site and all Contract documents prior to submittal of bid.

1. Submittal of a Bid shall indicate the Contractor has examined the Site and Drawings and has included all required allowances in this Bid. No allowance shall be made for errors resulting from the Contractor's failure to visit job sites and to review Drawings.
- D. Division 22 Work: Includes, but is not limited to, providing the following:
 1. Potable Water Distribution System: Fixtures, piping, equipment.
 2. Waste and Vent Systems: Piping and specialties.

1.03 ALTERNATES

- A. Refer to Division 01 for alternates.

1.04 CONTINGENCY

- A. Refer to Division 01 for amount to include in Mechanical Bid.

1.05 SUBMITTALS

- A. General:
 1. Preferred Submittal Format: PDF, unless otherwise noted.
 2. Preferred Submittal Nomenclature: Unless otherwise noted, PDF submittals are to be named according to the following:
 - a. [Specification Section Number] – [Specification Name or Equipment Included]
 3. Distribution: Unless otherwise noted, direct all correspondence concerning Division 22 submittals to:
 - a. Caleb Bulow
 - b. PRAIRIE ENGINEERING, P.C.
 - c. 1905 17TH STREET SE
 - d. MINOT, ND 58701
 - e. cbulow@prairieengineeringpc.com
- B. Substitution and Prior Approval to Quote:
 1. Format and Content: Complete descriptive technical data on the proposed item consisting of model numbers, type, size and performance characteristics.
 2. Submission Timing: Minimum of 192 hours (eight days) prior to bid opening.
 - a. Substitutions will not be permitted after bid opening except where such substitution is considered by the Engineer to be in the best interest of the Owner.
 3. Bidder Notification: Prior to bid opening via Addenda, sent to all planholders.
 4. Contractor Responsibility: This contractor will be responsible for all coordination, construction costs, and Architectural/Engineering design fees required to substitute equipment that has different characteristics than designed including weights, physical dimensions, clearances, mechanical characteristics, electrical characteristics, and other characteristics deemed important to the design by the Architect/Engineer.
 5. Alternative Format: Printed paper, two copies; Self-addressed, stamped envelope required for return reply.
- C. Schedule of Values
 1. Format and Content: When included with the Bid, at minimum the following categories shall be indicated:
 - a. "Project mobilization"
 - b. "Demolition"
 - c. "Insulation"
 - d. "Piping" (all piping, valves, shock arrestors, fittings, hangers, installed in place)

- e. "Plumbing Fixtures" (all fixtures, faucets/flush valves, drain assemblies, water coolers, installed in place)
 - f. "Plumbing Equipment" (all water heaters, recirculation pumps, expansion tanks, storage tanks, installed in place)
- 2. Submission Timing: Prior to first payment application.
- D. Shop Drawings
 - 1. Distribution: Engineer via the Prime Contractor for each item indicated.
 - 2. Format and Content: Include catalog numbers, performance data, dimensions and other descriptive information.
 - a. Contractor Review: Dated and signed cover sheet or review stamp for each Shop Drawing file to indicate thorough review. Email message text not acceptable.
 - b. Non-Conforming: Returned to Contractor without review.
 - 3. Submission Timing: Prior to delivery of materials to job site.
- E. Record Drawings
 - 1. Format and Content: Paper copy of Drawings project site.
 - a. As work progresses, Contractor's field supervisor shall mark Record Drawings in red pencil to indicate actual conditions of installation.
 - b. Give particular attention to marking actual locations of underground piping.
 - c. Affix all addendum and change order descriptions to appropriate record drawing sheet, utilizing spray adhesive.
 - d. Make Record Drawings available to Engineer during project visitation.
 - 2. Submission Timing: Close of project with Record Manuals.
- F. Spare Equipment and Devices
 - 1. Distribution: Owner.
 - 2. Format and Content: List quantities on contractor letterhead or invoice, obtain signature of Owner's representative acknowledging receipt, and include with each Record Manual.
 - 3. Submission Timing: Close of project with Record Manuals.
- G. Operation and Maintenance Manuals
 - 1. Submission Timing: Close of project, as condition of its acceptance.
 - 2. Record Manual information shall be included for all equipment/material where Shop Drawings are required.
 - 3. Format and Content: Two copies, Loose-leaf hardcover binders, and in PDF format on CDs or USB drive.
 - a. List project name, date, Contractor's name, address and telephone number on exterior label of each Record Manual and CD.
 - b. Include an index sheet indicating subcontractor and subcontractor's phone number; and each major piece of equipment, supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
 - c. Include a copy of the Shop Drawings.
 - d. Include all installation, operation and maintenance data packaged with any equipment.
 - e. Include all signed and dated final punch lists from walkthroughs performed by the Engineer.

1.06 APPLICATIONS FOR PAYMENT

- A. Refer to Division 1 "Applications for Payment".
- B. Provide one additional copy, sent directly to the Engineer.

- C. Schedule of Values: At minimum, include items in Submittal article.

1.07 CHANGES TO CONTRACT

- A. Any required changes to the contract after bid date shall be in accordance with General Conditions/Division 1 and this section. Where any discrepancies between the sections are encountered, the more restrictive section shall apply.
- B. Proposed changes shall be accompanied with complete substantiating documentation.
 - 1. Provide an itemized list of quantities for materials, equipment, and supplies.
 - a. Include unit costs for each item and extended price.
 - b. Include unit labor for each item and extended time.
 - 2. Provide subcontractor proposals that include the same substantiating documentation.
 - 3. Provide quotations from suppliers for any specially ordered equipment.
- C. Material costs shall be actual costs to the contractor, obtaining the materials through normal supply channels, including trade and quantity discounts. Utilizing "suggested pricing" from national pricing organizations for unit costs shall not be accepted. Upon request, the contractor or subcontractor shall submit evidence to substantiate the costs.
- D. Labor units shall be industry accepted standard labor hours to perform one unit of work. If the work is being performed in a location that is not considered to be standard working conditions for that specific task, additional labor shall be itemized.
- E. Labor rates shall be the actual rate paid for the workman category along with associated labor burden. Labor burden shall consist only of the mandatory fringe benefits, labor taxes, and labor insurances as affected by payroll. The owner reserves the right to reject any labor burden which is inconsistent with other similar contractors or where the fringe benefit cost is in excess of established labor agreements.
- F. Subcontractors shall compute their costs in the same manner as the contractor. Subcontractors are subject to the same markup constraints as described herein.
- G. For changes resulting in credit to the costs, no restocking fees for materials shall be applied by the contractor or subcontractors.

1.08 QUALITY ASSURANCE

- A. Qualifications of Installers
 - 1. For installation and testing, use only trained licensed and experienced workmen familiar with items required and manufacturer's recommended methods.
 - 2. In acceptance or rejection of installed work, no allowance will be made for lack of skill on the part of the workmen.

1.09 AUTHORITIES AND AGENCIES

- A. Materials, workmanship and installation: Comply with the latest editions of all applicable codes, local ordinances, industry standards, utility company regulations, insurance carrier requirements and these Specifications.
- B. Obtain and pay all permits, inspections, licenses and other charges pertaining to the Work. Upon completion of the Work, furnish proof of acceptance by proper agency having jurisdiction.
- C. Codes and standards shall include, but not necessarily be limited to, the following:
 - 1. International Energy Conservation Code (IECC);
 - 2. Uniform Plumbing Code;
 - 3. North Dakota State Building Code;
 - 4. International Building Code (IBC);

5. International Mechanical Code (IMC);
 6. International Fuel Gas Code (IFC);
 7. National Fire Protection Association (NFPA) – Sections as adopted by authority having jurisdiction.
- D. The more stringent provisions shall govern where provisions of pertinent codes and standards conflict with these Specifications or Drawings. Where Codes, Specifications or Drawings differ with one another, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies to the Engineer immediately.
1. Pertinent codes and standards shall not be cited to furnish less than specifically shown or specified.
 2. Meeting the minimum standards of the above Codes does not permit a lower grade of construction where Plans or Specifications call for workmanship or materials in excess of Code Requirements.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.10 GUARANTEE AND WARRANTY

- A. Except where otherwise noted, contractor shall guarantee materials, workmanship and the proper operation of equipment for a period of one year after Owner's beneficial use of the building or mechanical system. Contractor shall correct all equipment, material and workmanship found to be defective or non-conforming to the contract documents without cost to Owner during that one year period.
- B. Guarantee shall include trips to the project site by Contractor to adjust mechanical equipment as required, ensuring it is operating as intended.
- C. Specified guarantee shall not relieve Contractor from liability arising from improper installation or non-compliance with applicable codes.

1.11 TEMPORARY FACILITIES

- A. Refer to Special Conditions and/or Division 1 for details of temporary facilities.

1.12 NOMENCLATURE

- A. Pipe sizes listed are nominal pipe sizes throughout this Division except where otherwise noted.

PART 2 PRODUCTS

2.01 MATERIAL

- A. Material and equipment shall be as shown or specified. Provide material not specifically described but required for a complete and proper installation of the Work, subject to the acceptance of the Engineer.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."
- C. Owner will not be liable for material installed in non-compliance with codes, standards, and these Contract Documents.
- D. Fire Stop System material shall be by 3M "Fire Barrier", Metacaulk, Hilti, Nelson Firestop Products, or AD Fire.
- E. See Division 07 for further details on approved materials.

2.02 ELECTRIC WIRING

- A. The Division 22 Contractor shall furnish all motors, special controls and electrical devices as specified herein for proper operation of the equipment furnished.

- B. Division 26 Contractor shall furnish and install, as required, disconnects, starters, switches, etc., and do all necessary power and control wiring including the installation of electrical devices such as thermostats, humidistats, remote control panels, etc., furnished separately by Division 22 Contractor, unless otherwise noted in Equipment Specifications.

PART 3 EXECUTION

3.01 GENERAL

- A. Engineer, Architect, or Owner shall not be responsible for the means, methods, techniques, sequences or procedures of construction selected by Contractor.
- B. Engineer, Architect, or Owner shall not be responsible for safety precautions and programs incidental to work of Contractor.
- C. It is the sole responsibility of Contractor to initiate, maintain, and supervise all safety precautions and programs in connection with the Work.

3.02 SURFACE CONDITIONS

- A. Prior to work of each Section of Division 22, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this Division may be installed in accordance with all pertinent codes, regulations and standards.

3.03 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Division before, during and after installation and to protect the installed work and materials of all other trades.
- B. Plugs: Install in ends of uncompleted piping at end of each day or when work stops.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

3.04 COORDINATION

- A. Order material in a timely fashion to assure it is on the job site when required.
- B. Coordinate installation of material with schedule of other trades to prevent unnecessary delay in construction schedule.
- C. Division 22 piping equipment installations shall comply with National Electrical Code requirements 110.26 "working spaces" and "dedicated spaces". Plumbing pipes shall not be installed in the space near electrical panels/equipment defined as "working spaces" or "dedicated spaces".

3.05 DISCREPANCIES, CONSTRUCTION CONFLICTS AND DRAWINGS

- A. Discrepancies
 - 1. Prior to submitting bid, Contractor shall refer any apparent discrepancies or omissions to Engineer for clarification.
 - 2. The Architect, Engineer or Owner will not be responsible for any oral instructions or modifications to the contract documents prior to opening of bids.
 - 3. Written interpretation or clarification will be made by Addenda.
- B. Construction Conflicts
 - 1. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision.
 - 2. Do not proceed with installation in area of question until conflict has been fully resolved.

3. When so directed by Engineer, Contractor shall make minor adjustment to avoid interferences with other trades. Such minor adjustments shall be performed at no additional cost to the Architect, Engineer or Owner.
- C. Drawings
1. Drawings indicate extent and general layout of plumbing systems for project. Due to small scale, it is not possible to indicate all fittings and accessories that may be required. Provide such fittings and accessories as required to form a complete and operating system in general conformance with Specifications and Drawings.
 2. Exact locations, distances, levels and other conditions will be governed by the structure. Field measurements shall take precedence over the Drawings. Use the Drawings and these Specifications for guidance. Secure the Architect's approval for all changes in locations.
 3. Verify all measurements at site. No compensation will be made because of difference between locations shown on the Drawings and measurements at the building.
 4. Refer to the architectural drawings for dimensions and locations of walls, partitions, doors, windows, ceiling heights, door swings and other details of construction.

3.06 UNDERGROUND UTILITIES

- A. Locations of existing underground utilities are based on available site information and are shown approximately. Contractor shall determine exact utility locations before commencing work and shall be responsible for repair of damages resulting from his construction activities to pre-construction condition.
- B. Trench and backfill for installation of underground piping to depth shown or required. Remove any accumulated water in excavation by pumping. Shore and brace excavation as required by safety regulations. Provide temporary bridges to maintain normal traffic flow. Excavation and backfill required by mechanical installations shall be accomplished in accordance with Division 31 Specifications by this Contractor.

3.07 REMOVAL AND/OR REUSE OF EXISTING MATERIALS AND EQUIPMENT

- A. Existing equipment, which is indicated as being removed and not indicated for reuse, shall remain the property of the Owner, stored as directed. Any material the Owner does not wish to retain shall be removed and disposed by the Contractor.
- B. Contractor shall assume in his Bid that existing equipment and materials shown to be reused are in good working condition and can be installed without any repairs. If certain items are found to be in need of repair or in unusable condition, Contractor shall notify the Engineer for decision, however, Contractor shall be responsible for any damage by his personnel to equipment in removal or handling.
- C. Material and other equipment removed and to be reused shall be cleaned before reinstallation.

3.08 OFFSETS

- A. Where required to allow clearance of ducts, electrical conduit and outlet boxes, beams, etc., to avoid interference with work of other trades, to increase head room under pipes or to improve the appearance of pipe work, this Contractor shall offset his pipes as directed by the Architect/Engineer.

3.09 CUTTING AND PATCHING

- A. Refer to General Conditions. Unless specifically called out to be performed by other Contractors, the Plumbing Contractor shall perform all cutting and patching required for the installation of material and equipment furnished under his Contract.
- B. Fire-Barrier Penetrations

1. Pipe penetrations through fire rated walls and floors shall be sealed with a UL classified Fire Stop System. Fire Stops shall be provided in accordance with the appropriate System No. as it relates to pipe size/Material and wall or floor rating/material.
2. See Specification Section 220510 for other Fire-Barrier Penetration requirements.
3. See Section 2 article "Materials" of this Specification for approved fire stop system material.
- C. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all cost.
- D. Use only rotary type drilling tools to cut concrete.
- E. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.10 CONNECTIONS TO KITCHEN EQUIPMENT

- A. The Division 22 Contractor shall provide rough-ins and connect the Kitchen equipment which is shown on the Drawings. Refer to Kitchen Equipment Schedule on Architectural or Food Service Drawings and Mechanical Drawings for more information.

3.11 FIELD QUALITY CONTROL

- A. Perform field tests and inspections. Test new piping and parts of existing piping that have been altered, extended, or repaired.
- B. Piping Inspections:
 1. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - b. Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- C. Domestic Water Service Piping Tests: Test water service piping as required by the Authority Having Jurisdiction or the Plumbing Code, or, in absence of published procedures, as follows:
 1. Testing: Before the joints are covered in order for leaks to be detected.
 2. Pressure: Minimum of 125 psig.
 3. Duration: Two (2) hours.
 4. Valves: Operating test shall be performed on all valves when system is under full pressure to ensure proper operation. Perform multiple times during test to ensure proper operation.
 5. Certification: Backfilling shall not be resumed until test results and work have been approved by Architect/Engineer.
- D. Domestic Water, Sanitary, and Vent Piping Tests: Test domestic water, sanitary, and vent piping as required by the Authority Having Jurisdiction or the Plumbing Code, or, in absence of published procedures, as follows:
 1. Domestic Water Piping:
 - a. Pressure: Minimum of 125 psig.
 - b. Duration: Two (2) hours.
 2. Sewer, Soil, Waste, Drain and Vent Piping:
 - a. Procedure: Close all openings and pressurize with air.
 - b. Pressure: Minimum of 5 psig.
 - c. Duration: 15 minutes.
 - d. System may be tested in its entirety or in sections.
 3. Building sewer from the building to the sewer main:

- a. Insert a test plug at the point of connection with the Public sewer.
 - b. Pressure: 10 feet water head.
 - c. Duration: 15 minutes, constant water level.
- E. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained. Piping will be considered defective if it does not pass tests and inspections.

3.12 ADJUSTING

- A. Perform the following domestic water adjustments before operation:
 - 1. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - 2. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.13 DISINFECTION OF POTABLE WATER SYSTEM

- A. Clean interior of domestic water, septic, and vent piping systems. Remove dirt and debris as work progresses.
- B. New potable water systems shall be disinfected prior to use whenever required by the Authority having jurisdiction. The method to be followed shall be that prescribed by the Health Authority or, in case no method is prescribed by the Health Authority, the following: Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 - 1. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - 2. The procedure shall be repeated if it is shown by a bacteriological examination, made by the Authority, that contamination still persists in the system.
- C. After all tests have been made and the plumbing systems are operating properly, this Contractor shall go over the entire system and remove labels from all plumbing fixtures.

3.14 INSTRUCTIONS

- A. Provide written and oral operating and maintenance instructions to Owner's representatives. The oral instructions shall be given before the Owner occupies the buildings. Instructions to include all building's plumbing systems and equipment.
- B. Division 22 Contractor shall coordinate with Owner at Owner's convenience, formal instruction time for contractor personnel to instruct Owner's Representatives on all equipment. Provide similar equipment supplier's instructions where specified thus.
- C. Formal instructions shall be video recorded when required by other Sections of this Specification by this Contractor. Format shall be DVD. Formal instruction to be included with each Record Manual, being referenced to and a part of the Manual.

3.15 CLEAN UP

- A. Each Contractor shall be responsible for cleaning up after his work, including the removal of all scrap material left on the job by his men or Subcontractors. This will include the removal of all pipe cuttings, pieces of pipe and insulation and other debris.
- B. After all tests have been made and the plumbing systems are operating properly, this Contractor shall go over the entire system and remove labels from all plumbing fixtures and other plumbing equipment.
- C. All equipment having finished paint surfaces shall be examined upon completion for scratches and other damage. Touch up all surfaces as required with paint of color to match factory finish.

END OF SECTION

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Stencils.
- B. Pipe markers.

1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

PART 2 PRODUCTS

2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

- A. Stencil:
 - 1. Piping: 3/4 inch diameter and higher.
- B. Pipe Markers: 3/4 inch diameter and higher.

2.02 STENCILS

- A. Pipe: Stencil size required per external insulated or uninsulated pipe diameter.
 - 1. 3/4 to 1-1/4 inch Range: 1/2 inch text over 8 inch long background.
 - 2. 1-1/2 to 2 inch Range: 3/4 inch text over 8 inch long background.
 - 3. 2-1/2 to 6 inch Range: 1-1/4 inch text over 12 inch long background.

2.03 PIPE MARKERS

- A. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.
- B. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Apply ASME A13.1 Pipe Marking Rules:
 - 1. Place pipe marker adjacent to changes in direction.
 - 2. Place pipe marker adjacent each valve port and flange end.
 - 3. Place pipe marker at both sides of floor and wall penetrations.
 - 4. Place pipe marker every 25 to 50 feet interval of straight run.

END OF SECTION

SECTION 22 0719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Combustible pipe insulation.
- B. Glass fiber insulation.
- C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- B. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- C. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- D. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- G. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER INSULATION

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 - 4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 - 5. Substitutions: See Section 23 0500 - HVAC General Provisions.

- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
 - 1. K Value: ASTM C177, 0.23 at 75 degrees F.
 - 2. Maximum Service Temperature: 220 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.03 COMBUSTIBLE PIPE INSULATION

- A. Manufacturers:
 - 1. Johns Manville Corporation; _____: www.jm.com/#sle.
 - 2. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Insulation: ASTM C547; rigid, molded, noncombustible.
 - 1. Rated to a maximum 25/50 FS/SD per ASTM E84, CAN ULC S102.

2.04 JACKETING AND ACCESSORIES

- A. PVC Plastic Jacket:
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil, 0.010 inch.
 - e. Connections: Brush on welding adhesive.
- B. ABS Plastic Jacket:
 - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: Minus 40 degrees F.
 - b. Maximum Service Temperature: 180 degrees F.
 - c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 30 mil, 0.03 inch.
 - e. Connections: Brush on welding adhesive.
- C. Reinforced Tape:
 - 1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
 - 2. Comply with UL 723 or ASTM E84.
 - 3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

- D. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- G. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert Location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 8400
 - 1. At fire separations, terminate insulation at fire-rated wall and partition penetrations.
- J. Fire-Barrier Penetration Protection:
 - 1. Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
 - 2. Provide intumescent collars, wraps, fire bands, sealants, and other firestopping materials as required to maintain the fire ratings for the piping and insulation materials used.
 - 3. Install Fire Stop Systems per the manufacturers guidelines.
- K. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil, 0.001 inch thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

3.02 SCHEDULES

- A. Domestic Hot Water Supply, Above 140 degree F:
 - 1. Glass Fiber Insulation: Aboveground.
 - 2. Elastomeric Cellular Insulation: Aboveground and belowground.
 - 3. 1-1/4" diameter pipe and smaller: 1-1/2" thick, R-6 minimum.
 - 4. 1-1/2" diameter pipe and larger: 2" thick, R-8 minimum.
- B. Domestic Hot Water Supply and Recirculating Water, 140 degree F and below:
 - 1. Glass Fiber Insulation: Aboveground.

2. Elastomeric Celular Insulation: Aboveground and belowground.
3. 1-1/4" diameter pipe and smaller: 1" thick, R-4 minimum.
4. 1-1/2" diameter pipe and larger: 1-1/2" thick, R-6 minimum.
5. Domestic Cold Water:
 - a. Glass Fiber Insulation: Aboveground.
 - b. Elastomeric Celular Insulation: Aboveground and belowground.
 - c. 1-1/4" diameter pipe and smaller: 1" thick, R-4 minimum.
 - d. 1-1/2" diameter pipe and larger: 1-1/2" thick, R-6 minimum.
6. Roof Drain Bodies:
 - a. 1" premolded or job-fabricated glass fiber insulation. Over insulation, apply 6 ounce canvas neatly pasted in place and apply two coats of sealant over the entire surface.
7. Roof Drainage Above Grade:
 - a. Metal Piping: Glass fiber insulation, 1" thick.
8. Roof Drainage Within 10 Feet of the Exterior:
 - a. Fiberglass insulation, 1" thick, R-4 minimum.
9. Plastic Piping, ceiling plenum spaces:
 - a. Combustible pipe insulation.
10. Waste piping crossing geothermal piping, underground:
 - a. Expanded Polystyrene insulation, 2" thick
 - b. Extend: 2 feet minimum each side of waste pipe.

END OF SECTION

SECTION 22 1005 - PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary waste piping, buried within 5 feet of building.
- B. Sanitary waste piping, above grade.
- C. Domestic water piping, buried within 5 feet of building.
- D. Domestic water piping, above grade.
- E. Storm drainage piping, buried within 5 feet of building.
- F. Storm drainage piping, above grade.
- G. Pipe flanges, unions, and couplings.
- H. Pipe hangers and supports.
- I. Pipe sleeve-seal systems.
- J. Angle valves.
- K. Ball valves.

1.02 RELATED REQUIREMENTS

- A. Section 22 0719 - Plumbing Piping Insulation.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
- D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.
- E. ASME B16.51 - Copper and Copper Alloy Press-Connect Pressure Fittings; 2021.
- F. ASME B31.9 - Building Services Piping; 2020.
- G. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- H. ASTM B32 - Standard Specification for Solder Metal; 2020.
- I. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- L. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.
- M. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.
- N. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.
- O. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).
- P. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2024.
- Q. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2024.

- R. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).
- S. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).
- T. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2024.
- U. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2023.
- V. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2024.
- W. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.
- X. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2023.
- Y. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.
- Z. AWWA C606 - Grooved and Shouldered Joints; 2022.
- AA. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.
- BB. IAPMO (UPC) - Uniform Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- CC. IAPMO/ANSI/CAN Z1117 - Standard for Press Connections; 2022.
- DD. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- EE. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- FF. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.
- GG. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- HH. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- II. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. CPVC Pipe: ASTM D2846/D2846M, ASTM F441/F441M, or ASTM F442/F442M.
 - 1. Fittings: CPVC; ASTM D2846/D2846M, ASTM F437, ASTM F438, or ASTM F439.
 - 2. Joints: ASTM D2846/D2846M, solvent weld with ASTM F493 solvent cement.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 SANITARY WASTE PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B306, DWV.
 - 1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
 - 2. Joints: ASTM B32, alloy Sn50 solder.
- B. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.04 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Pipe: ASTM B88 (ASTM B88M), Type L or K, Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
 - 3. Mechanical Press Sealed Fittings: ASME B16.51 or IAPMO/ANSI/CAN Z1117, ICC (IPC), and IAPMO (UPC) approved, NSF 61 and NSF 372 certified, with EPDM seals.
 - a. Manufacturers:
 - 1) Anvil International: www.anvilintl.com/#sle.
 - 2) Apollo Valves: www.apollovalves.com/#sle.
 - 3) NIBCO, Inc.

2.05 STORM DRAINAGE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.06 STORM DRAINAGE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.07 PIPE FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 inch and Under:
 - 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Sizes Over 1 inch:
 - 1. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 - 1. Dimensions and Testing: In accordance with AWWA C606.
 - 2. Housing Material: Provide ASTM A47/A47M malleable iron, ductile iron, or _____, galvanized.
 - 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 - 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.08 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
 - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
 - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
 - 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 - 2. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
 - 3. Wall Support for Pipe Sizes to 3 inch: Cast iron hook.
 - 4. Wall Support for Pipe Sizes 4 inch and Over: Welded steel bracket and wrought steel clamp.
- C. Plumbing Piping - Water:
 - 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 - 2. Hangers for Cold Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.
 - 3. Hangers for Hot Pipe Sizes 2 to 4 inch: Carbon steel, adjustable, clevis.
 - 4. Wall Support for Pipe Sizes Up to 3 inch: Cast iron hook.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 - 1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
 - 2. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
 - 3. Other Types: As required.

2.09 PIPE SLEEVE-SEAL SYSTEMS

- A. Modular Mechanical Seals:
 - 1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
 - 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
 - 3. Size and select seal component materials in accordance to service requirements.
 - 4. Glass reinforced plastic pressure end plates.

2.10 BRONZE, ANGLE VALVES

- A. Class 125; CWP Rating: 200 psi:
 - 1. Comply with MSS SP-80, Type 1.

2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. Packing: Asbestos free.
4. Handwheel: Bronze or aluminum.

2.11 BALL VALVES

- A. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, threaded or grooved ends with union.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- C. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- F. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- G. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- H. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- I. Sleeve pipes passing through partitions, walls, and floors.
- J. Pipe Hangers and Supports:
 1. Install in accordance with ASME B31.9.
 2. Support horizontal piping as indicated.
 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 4. Place hangers within 12 inches of each horizontal elbow.
 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 6. Provide copper plated hangers and supports for copper piping.
 7. Support cast iron drainage piping at every joint.
- K. Pipe Sleeve-Seal Systems:
 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 3. Locate piping in center of sleeve or penetration.
 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 5. Tighten bolting for a watertight seal.

- 6. Install in accordance with manufacturer's recommendations.
- L. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.03 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.04 FIELD TESTS AND INSPECTIONS

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
 - 1. Perform hydrostatic testing for leakage prior to system disinfection.
 - 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
 - 3. General:
 - a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.
- C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.05 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed, and clean.
- B. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- C. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- D. Maintain disinfectant in system for 24 hours.
- E. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- F. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

3.06 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inch to 1-1/4 inch:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inch to 2 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inch to 3 inch:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.
 - 2. Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft.

- 2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Washing machine outlet boxes.
- E. Ice maker outlet boxes.

1.02 REFERENCE STANDARDS

- A. ASME A112.6.3 - Floor Drains; 2022.
- B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
- D. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- E. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.03 SUBMITTALS

- A. See Section 22 0500 - Plumbing General Provisions for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, and water hammer arrestors.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

- A. Manufacturers:
 - 1. Josam Company: www.josam.com/#sle.
 - 2. MIFAB, Inc: www.mifab.com/#sle.
 - 3. Sioux Chief Manufacturing.
 - 4. Watts Drainage Products.
 - 5. Zurn Industries, LLC: www.zurn.com/#sle.
 - 6. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Roof Drains:
 - 1. Assembly: ASME A112.6.4.
 - 2. Body: Lacquered cast iron with sump.
 - 3. Strainer: Removable cast metal dome.
 - 4. Accessories: Coordinate with roofing type:

- a. Membrane flange and membrane clamp with integral gravel stop.
 - b. Adjustable under deck clamp.
 - c. Roof sump receiver.
- C. Roof Overflow Drains:
 - 1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 inches above flood elevation.
- D. Downspout Nozzles:
 - 1. Basis of Design: Zurn model Z199.
 - 2. Bronze round with straight bottom section.
- E. Floor Drains:
 - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
 - 2. Pre-packaged shims for tilt correction.
 - 3. Above Grade Drain Bodies: Provide flashing materials of 8" minimum wider in all directions from drain body.

2.03 CLEANOUTS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
 - 2. Josam Company: www.josam.com/#sle.
 - 3. MIFAB, Inc: www.mifab.com/#sle.
 - 4. Sioux Chief Manufacturing Company, Inc.
 - 5. Watts Drainage Products.
 - 6. Zurn Industries, LLC: www.zurn.com/#sle.
 - 7. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Cleanouts at Exterior Surfaced Areas:
 - 1. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Exterior Unsurfaced Areas:
 - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- D. Cleanouts at Interior Finished Floor Areas:
 - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- E. Cleanouts at Interior Finished Wall Areas:
 - 1. Soil pipe test tee body, match material to connected piping.
 - 2. Raised head, threaded plug.
 - 3. Round stainless steel access cover secured with machine screw.
- F. Cleanouts at Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 HOSE BIBBS

- A. Manufacturers:
 - 1. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
 - 2. Watts Regulator Company: www.wattsregulator.com/#sle.
 - 3. Zurn Industries, LLC: www.zurn.com/#sle.

4. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Interior Hose Bibbs:
 1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome-plated where exposed with handwheel, nonremovable vacuum breaker in compliance with ASSE 1011.

2.05 WASHING MACHINE OUTLET BOXES

- A. Manufacturers:
 1. IPS Corporation/Water-Tite: www.ipscorp.com/#sle.
 2. Oatey Supply Chain Services, Inc: www.oatey.com/#sle.
 3. Precision Plumbing Products.
 4. Sioux Chief Manufacturing Company, Inc.
 5. Zurn Industries, LLC: www.zurn.com/#sle.
 6. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Description: Plastic preformed rough-in box with brass valves with single lever handle, socket for 2 inch waste, slip in finishing cover.

2.06 ICE MAKER OUTLET BOXES

- A. Manufacturers:
 1. IPS Corporation/Water-Tite; _____: www.ipscorp.com/#sle.
 2. Oatey Supply Chain Services, Inc; _____: www.oatey.com/#sle.
 3. Zurn Industries, LLC; _____: www.zurn.com/#sle.
 4. Precision Plumbing Products.
 5. Sioux Chief Manufacturing Company, Inc.
 6. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Description: Plastic preformed square or round rough-in box with brass quarter-turn ball valve, and slip-in finishing cover.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.02 DRAINS

- A. Protect drains during construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Floor Drains:
 1. Set grates flush with finished floor, unless otherwise indicated.
 2. Size same as drainage piping.
 3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
- C. Roof Drains:
 1. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
 2. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 3. Install expansion joints, if indicated, in roof drain outlets.

4. Position roof drains for easy access and maintenance.
 5. Roof drain schedule:
 - a. Domed Roof Drains: Limited access roofs.
 - b. Small-Sump Body: 4" conductor size and smaller.
 - c. Standard-Sump Body: 8" conductor size and smaller.
 - d. Large-Sump Body: 10" up to 16" conductor size.
 6. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - a. Lead Sheets: Burn joints of 6.0-lb/sq. ft. lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.
 - b. Copper Sheets: Solder joints of copper sheets.
 7. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 8. Pipe Flashing: Sleeve type, matching the pipe size, with a minimum length of 10 inches and with skirt or flange extending at least 8 inches around pipe.
 9. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 10. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
 11. Set flashing on roofs in solid coating of bituminous cement.
 12. Secure flashing into sleeve and specialty clamping ring or device.
 13. Fabricate and install flashing and pans, sumps, and other drainage shapes.
- D. Downspouts:
1. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.
 2. Install downspout nozzles to discharge at 12" above grade.

3.03 CLEANOUTS

- A. Extend cleanouts to finished floor or wall surface.
- B. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil.
 1. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Floor Cleanouts: Install at elevation to accommodate finished floor.
- E. Wall Cleanouts: Install chrome access covers.
- F. Location:
 1. At each aggregate change in direction of piping greater than 135 degrees.
 2. Intervals of 75 feet, minimum.
 3. At base of each vertical soil and waste stack.
- G. Sizing Schedule, unless otherwise indicated:
 1. Up to 4" Drain Pipe : Size same as drainage piping.
 2. Above 4" up to 6": 4" cleanout.
 3. Above 6": 6" cleanout, unless larger is indicated.

END OF SECTION

SECTION 22 1329 - SANITARY SEWERAGE PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Submersible sewage pumps.
- B. Sewage pump basins and pits.

1.02 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2020).
- B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 2014 (Reaffirmed 2020).
- C. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NEMA MG 00001 - Motors and Generators; 2024.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Include dimensions and performance data.
- C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.04 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship within specified period.
 - 1. Warranty Period: Not less than one year from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 SUBMERSIBLE SEWAGE PUMPS

- A. Manufacturers:
 - 1. Grundfos Pumps Corporation: www.grundfos.com/#sle.
 - 2. Weil Pump Company, Inc: www.weilpump.com/#sle.
 - 3. Zoeller Company: www.zoeller.com/#sle.
 - 4. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Description: Submersible centrifugal pump made of rugged stainless steel and cast-iron housing and base with oil-filled motor chamber, ball bearings, and mechanical seal.
- C. Casing:
 - 1. Capable of withstanding pressures 50 percent greater than maximum operating pressure.
 - 2. Volute: Consisting of smooth passages providing unobstructed flow through pump.
 - 3. Exposed Nuts and Bolts: Stainless steel construction.
 - 4. Finish: Protect casing exterior surfaces in contact with sewage using sewage-resistant coal tar epoxy coating.
- D. Pump Shaft: Fabricate of high-grade alloy steel of adequate strength and size, with application-appropriate safety factor to transmit full driver horsepower. Include shaft key so that impeller cannot be loosened by either reverse or forward torque.

- E. Impeller:
 - 1. Bronze; open non-clog, stainless steel shaft, single shrouded to minimize clogging due to heavy sludge found in sewage.
 - 2. Securely keyed to shaft with locking arrangement preventing loosening by torque from either forward or reverse direction.
 - 3. Balance statically, dynamically, and hydraulically within recommended operating range from duty point.
- F. Wear Rings: Renewable; provided on casing and impeller with wearing surfaces normal to axis of rotation. Material suitable for ease of maintenance and secured to prevent rotation.
- G. Bearings:
 - 1. Provide roller type capable to handle multi-directional thrust loads.
 - 2. Do not use pumps dependent on thrust and hydraulic balance.
 - 3. Bearing Life: L-10, 50,000 hours minimum, complying with ABMA STD 9 or ABMA STD 11.
- H. Seals:
 - 1. Provide tandem mechanical shaft seal system running in oil bath.
- I. Motor:
 - 1. Base-mounted, enclosed, lubricated oil-free, thermal-overload protected, continuous-duty, permanent split capacitor with oil-resistant, three-prong connector, 6-foot power cord.
 - 2. Watertight with Class F insulation, NEMA B design, complying with NEMA MG 00001.
 - 3. Provide oil filled, air filled with water jacket, or air filled with cooling fins that encircle stator housing.
- J. Power Cable:
 - 1. Enters through heavy-duty entry assembly provided with internal grommet assembly to prevent leakage.
 - 2. Separate motor and cable entry junction by terminal board or stator lead sealing gland that prevents foreign material from gaining access to motor interior through top of pump.
 - 3. Standard construction for submersible pump applications; do not use materials consisting of silicones.
- K. Controls: Integral, chemically-resistant, vertical plated-steel rod float switch. Cycle pump ON/OFF between 2.5- and 9-inch heights from bottom of pump.
- L. Solids Handling Capacity: Pass lint and other small solids up to 2 inch in size.
- M. Discharge Pipe Size: 2 inches, NPT, female.
- N. Maximum Water-Based Effluent Temperature: 120 degrees F.
- O. Accessories: Provide reverse flow assembly and high-level audio/visual alarm system.

2.02 SEWAGE BASINS AND PITS

- A. Simplex Basin:
 - 1. Simplex Basin Diameter and Height: 18 by 30 inches.
 - 2. Molded-Finish Requirements: Hard bottom, watertight, gastight, and radon-tight molding.
 - 3. Basin Material: Polyethylene structural-foam, heavy-duty injection-molded.
 - 4. Below Ground Pipe Inlet: Molded or predrilled with seal, 3 inches.
 - 5. Maximum Waste Effluent Temperature: Match or exceed maximum pump service temperature.
 - 6. Basin Cover: 1-1/4-inch discharge, 1-1/2-inch vent, and cord grommet openings with hubs.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install products with related fittings and accessories according to manufacturer instructions.
- B. Provide accessories required to complete installation in accordance with ICC (IPC).

3.02 PROTECTION

- A. Protect installed products from damage due from subsequent construction operations.
- B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION

SECTION 22 3000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Residential electric water heaters.
- B. Condensate removal pumps.

1.02 REFERENCE STANDARDS

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

- A. See Section 22 0500 - Plumbing General Provisions for submittals procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- C. Project Record Documents: Record actual locations of components.
- D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.05 WARRANTY

- A. Water Heaters
 - 1. Manufacturer's standard form in which manufacturer agrees to repair or replace components that fail in materials or workmanship for not less than one year from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 WATER HEATERS

- A. Manufacturers:
 - 1. A.O. Smith Water Products Co: www.hotwater.com/#sle.
 - 2. Bock Water Heaters, Inc: www.bockwaterheaters.com/#sle.
 - 3. Bradford White Corporation.
 - 4. Rheem Manufacturing Company: www.rheem.com/#sle.
 - 5. State Water Heaters.
 - 6. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Residential Electric Water Heaters:
 - 1. Type: Automatic, electric, vertical storage.
 - 2. Minimum Efficiency Required: ASHRAE Std 90.1 I-P.
 - 3. Performance: As scheduled.

4. Electrical Characteristics: As scheduled.
5. Tank: Glass lined welded steel, thermally insulated with one inch thick glass fiber; encased in corrosion-resistant steel jacket; baked-on enamel finish.
6. Controls: Automatic water thermostat with externally adjustable temperature range from 120 to 170 degrees F, flanged or screw-in nichrome elements, enclosed controls and electrical junction box and operating light. Wire double element units so elements do not operate simultaneously.
7. Accessories:
 - a. Water Connections: Brass.
 - b. Dip Tube: Brass.
 - c. Drain valve.
 - d. Anode: Magnesium.
 - e. Temperature and Pressure Relief Valve: ASME labeled.

2.02 CONDENSATE REMOVAL PUMPS

- A. Manufacturers:
 1. Franklin Electric Company: www.franklin-electric.com/#sle.
 2. Liberty Pumps Inc: www.libertypumps.com/#sle.
 3. Little Giant Pump Co.
 4. Substitutions: See Section 22 0500 - Plumbing General Provisions .
- B. Construction: Commercial grade, nonferrous pump with stainless steel shaft, integral discharge check valve, integral float switch, safety switch, thermoplastic reservoir, motor assembly, and power cord with ground.
- C. Safety: UL 778.
- D. Electrical Characteristics:
 1. 120 VAC, single phase, 60 Hz.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions required for applicable certifications.
- B. Equipment Connections:
- C. Pumps:
 1. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
 2. Provide electrical interlocking from cooling condensate pump safety switch to associated HVAC unit(s) furnished under other Sections.
 3. Extend condensate pump discharge to open drain.

3.02 WATER HEATERS

- A. If any device, fixture, or panel is required to be wall mounted by this contractor, provide AC Plywood, 3/4" or 5/8" thickness, painted both sides with fireproof paint, color to be determined and coordinated with owner. Paint is required even if installed on a non-fire rated wall.
- B. Residential, Water Heater Mounting: Install residential, water heaters on floor, or on water-heater stand on floor if required to be elevated 18".

- C. Install water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances.
 - 1. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
 - 2. Install shutoff valves on water-supply piping to water heaters and on hot-water outlet piping.
 - 3. Where installing piping adjacent to water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of water heaters.

3.03 FIELD QUALITY CONTROL

- A. Cleaning:
 - 1. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed, use procedure described in section 22 0500 - Plumbing General Provisions.

END OF SECTION

SECTION 22 4000 - PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tank type water closets.
- B. Wall hung urinals.
- C. Lavatories.
- D. Sinks.
- E. Under-lavatory pipe supply covers.
- F. Indoor drinking fountains.
- G. Bottle filling drinking fountains.
- H. Bi-level, electric water coolers.

1.02 REFERENCE STANDARDS

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).
- C. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).
- D. ASME A112.18.1 - Plumbing Supply Fittings; 2024.
- E. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).
- F. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2024.
- G. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2022.
- H. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2022.
- I. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
- J. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- K. NSF 61 - Drinking Water System Components - Health Effects; 2024.
- L. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 TANK TYPE WATER CLOSETS

- A. Manufacturers:
 - 1. American Standard, Inc: www.americanstandard-us.com/#sle.
 - 2. Kohler Company: www.kohler.com/#sle.
 - 3. Mansfield Plumbing Products LLC: www.mansfieldplumbing.com/#sle.
 - 4. PROFLO: www.ferguson.com/#sle.
 - 5. Sloan Valve: www.sloanvalve.com/#sle.
 - 6. Zurn Industries, LLC: www.zurn.com/#sle.
 - 7. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Floor-Mounted Bowl:
 - 1. ASME A112.19.2; siphon jet, vitreous china, close-coupled closet combination with elongated rim, insulated vitreous china closet tank with fittings and lever flushing valve, bolt caps, vandalproof cover locking device.
 - 2. Water Consumption: 1.6 gal per flush, maximum.
 - 3. ADA Rim Height: 17"
 - 4. Standard Rim Height: 15"
- C. Toilet Seats:
 - 1. Plastic: Solid, white, elongated, closed front, slow-closing hinged seat cover, and brass bolts with covers.
 - 2. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Bemis Manufacturing Company: www.bemismfg.com/#sle.
 - c. PROFLO: www.ferguson.com/#sle.
 - d. Church Seat Company: www.churchseats.com/#sle.
 - e. Zurn Industries, LLC: www.zurn.com/#sle.
 - f. Substitutions: See Section 22 0500 - Plumbing General Provisions.

2.03 WALL HUNG URINALS

- A. Manufacturers:
 - 1. Crane.
 - 2. American Standard, Inc: www.americanstandard-us.com/#sle.
 - 3. Kohler Company: www.kohler.com/#sle.
 - 4. PROFLO: www.ferguson.com/#sle.
 - 5. Zurn Industries, LLC: www.zurn.com/#sle.
 - 6. Sloan.
 - 7. Toto.
 - 8. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
 - 1. Consumption Volume: 1.0 gal per flush, maximum.
 - 2. Flush Valve: Exposed (top spud).

3. Flush Operation: Manual, oscillating handle.
4. Trapway Outlet: Integral.
- C. Flush Valves:
 1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Delany Products: www.delanyproducts.com/#sle.
 - c. Sloan Valve Company: www.sloanvalve.com/#sle.
 - d. Zurn Industries, LLC: www.zurn.com/#sle.
 - e. Substitutions: See Section 22 0500 - Plumbing General Provisions.
 2. Manual Operated:
 - a. Type: ASME A112.18.1 or ASME A112.19.5; diaphragm type, complete with vacuum breaker stops, and accessories.
 - b. Supplied Volume Capacity: 1.5 gal per flush.
 3. Exposed Type: Chrome-plated, escutcheon, integral screwdriver stop.
- D. Urinal Carriers:
 1. Manufacturers:
 - a. Jay R. Smith Manufacturing Company: www.jrsmith.com/#sle.
 - b. JOSAM Company: www.josam.com/#sle.
 - c. Zurn Industries, LLC: www.zurn.com/#sle.
 - d. Watts Drainage.
 - e. Substitutions: See Section 22 0500 - Plumbing General Provisions.
 2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

- A. Manufacturers:
 1. American Standard, Inc: www.americanstandard-us.com/#sle.
 2. Kohler Company: www.kohler.com/#sle.
 3. Mansfield Plumbing Products LLC: www.mansfieldplumbing.com/#sle.
 4. Zurn Industries, LLC: www.zurn.com/#sle.
 5. Toto.
 6. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Wall-Hung Basin:
 1. Vitreous China, Grade A: ASME A112.19.2; white, rectangular commercial-grade sink with predrilled holes, rear-center drain, front overflow, and hanger. Size as indicated on drawings with 4-inch centerset spacing.
 2. Carrier:
 - a. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.
 - b. Manufacturers:
 - 1) Jay R. Smith MFG. Co: www.jrsmith.com/#sle.
 - 2) JOSAM Company: www.josam.com/#sle.
 - 3) Zurn Industries, LLC: www.zurn.com/#sle.
 - 4) Watts Drainage.
 - 5) Substitutions: See Section 22 0500 - Plumbing General Provisions.
- C. Drop-In Basin:

1. Vitreous China: ASME A112.19.2; self-rimming, white, oval shape, front overflow, seal of putty, caulking, or concealed vinyl gasket, and white finish. Size as indicated on drawings with 4-inch centerset spacing.
- D. Supply Faucet:
1. Deck Mounted Faucet Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Grohe America, Inc: www.grohe.com/us/#sle.
 - c. Kohler Company: www.kohler.com/#sle.
 - d. PROFLO: www.ferguson.com/#sle.
 - e. Zurn Industries, LLC: www.zurn.com/#sle.
 - f. Chicago Faucets.
 - g. Delta Faucet Company.
 - h. Elkay.
 - i. Just Manufacturing.
 - j. Moen Incorporated.
 - k. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- E. Sensor Operated Faucet:
1. Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
 2. Spout Style: Standard.
 3. Power Supply:
 - a. Wireless:
 - 1) Battery: Replaceable alkaline or lithium type with 200,000 cycles, minimum.
 - 2) Low Battery Warning: Provide red or yellow colored indicator to light periodically at 30 days of remaining capacity and continuously 2 weeks prior to get fully discharged.
 4. Mixing Valve: None, single line for tempered water.
 5. Water Supply: 3/8 inch compression connections.
 6. Aerator: Vandal resistant, 0.5 gpm, laminar flow device.
 7. Automatic Shut-off: 30 seconds.
 8. Sensor Range: Factory set at 3 inch adjustable up to 24 inch.
 9. Finish: Polished chrome.
- F. Thermostatic Mixing Valve:
1. ASSE 1070 listed with combination stop, strainer, and check valves, and flexible stainless steel connectors.
 2. Braided hot and cold water supply lines.
- G. Accessories:
1. Offset waste with perforated open strainer.
 2. Wheel handle stops.

2.05 SINKS

- A. Manufacturers:
1. American Standard, Inc: www.americanstandard-us.com/#sle.
 2. Kohler Company: www.kohler.com/#sle.
 3. Elkay Manufacturing Co.
 4. Just Manufacturing.
 5. Franke Kindred Canada.

6. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Single Compartment Bowl
 1. ASME A112.19.3; 18 gauge, 0.0478 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 2. Drain: 1-1/2 inch chromed brass.
 3. Drain: 3-1/2 inch crumb cup and tailpiece.
- C. Double Compartment Bowl:
 1. ASME A112.19.3; 18 gauge, 0.0478 inch thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.
 2. Drain: 1-1/2 inch chromed brass.
 3. Drain: 3-1/2 inch crumb cup and tailpiece.
- D. Kitchen Faucets:
 1. Manufacturers:
 - a. American Standard, Inc: www.americanstandard-us.com/#sle.
 - b. Chicago Faucets.
 - c. Component Hardware Group, Inc.
 - d. Delta Faucet Company.
 - e. Elkay.
 - f. Grohe America, Inc: www.grohe.com/us/#sle.
 - g. Just Manufacturing.
 - h. Kohler.
 - i. Moen Incorporated.
 - j. Sloan.
 - k. T & S Brass and Bronze Works, Inc.
 - l. Zurn.
 - m. Substitutions: See Section 22 0500 - Plumbing General Provisions.
 2. Single Handle Faucet with Three-Function Pulldown Spray Head:
 - a. Type: Deck-mount, swivel faucet with mounting plate.
 - b. Spray Functions: Stream, full spray and pause at 1.8 gpm, maximum.
 - c. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
 - d. Materials: Ceramic disc-cartridge valve on brass body with polished chrome finish.
- E. Accessories: Provide braided water supply lines, slip-joint p-trap, and stainless steel basket strainer.

2.06 UNDER-LAVATORY PIPE SUPPLY COVERS

- A. General:
 1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
 2. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
 3. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 - b. Comply with ICC A117.1.
 4. Color: White.
 5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. No cable ties allowed.

2.07 BI-LEVEL, ELECTRIC WATER COOLERS

- A. Manufacturers:
 - 1. Elkay Manufacturing Company: www.elkay.com/#sle.
 - 2. Haws Corporation: www.hawesco.com/#sle.
 - 3. Halsey Taylor: www.halseytaylor.com/#sle.
 - 4. Oasis International: www.oasiscoolers.com/#sle.
 - 5. Substitutions: See Section 22 0500 - Plumbing General Provisions.
- B. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
 - 1. Capacity: 8 gph of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
 - 2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot cord and plug for connection to electric wiring system including grounding connector.
- C. Bottle Filler: Materials to match fountain.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install water supply piping connections. Provide stop on each supply in readily-serviceable location.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall supports and bolts.
- F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
- G. Install deep-pattern escutcheons if required to conceal protruding fittings.
- H. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant to fixture color.
- I. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks and lavatories.

3.03 WATER CLOSETS

- A. Solidly attach water closets to floor with lag screws. Lead flashing is not intended to hold fixture in place.
- B. Install toilet seats on water closets.

3.04 LAVATORIES

- A. Install water temperature limiting devices on all public lavatories.

- B. Install supports, affixed to building substrate, for wall-mounted lavatories.

3.05 WATER COOLERS

- A. Install water-supply piping with shutoff ball valve on supply to each fixture to be connected to domestic-water distribution piping. Install valves in locations where they can be easily reached for operation.

3.06 INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.07 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. Operate and adjust fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- C. Adjust water pressure at bubblers, faucets and flushometer valves to produce proper flow.
- D. Install fresh batteries in battery-powered, electronic-sensor mechanisms.
- E. Set field-adjustable temperature set points of temperature-actuated water mixing valves. Adjust set point within allowable temperature range.

3.08 CLEANING

- A. Clean plumbing fixtures and equipment.

3.09 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 0500 - HVAC GENERAL PROVISIONS

PART 1 GENERAL

1.01 SUMMARY

A. Specification Format

1. These Specifications are written in imperative and abbreviated form. This imperative language of the technical sections is directed at the Contractors, unless specifically noted otherwise.
Incomplete sentences shall be completed by inserting "shall", "the Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, perform all indicated requirements whether stated imperatively or otherwise.
2. Three Part Format
 - a. "Part 1 - General": Covers those areas which relate to the Work, and which define the general administrative and technical requirements specific to a particular section.
 - b. "Part 2 - Products": Defines, in detail, the acceptance equipment and materials to be incorporated into the Work.
 - c. "Part 3 - Execution": Describes, in detail, the manner in which items covered by Part 2 are to be incorporated into the Work.
3. Where Codes, Specifications and Drawings are in conflict, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies immediately to the Engineer prior to commencing related work.

B. Definitions:

1. Furnish: Supply equipment as required by these Drawings and Specifications, delivered to the job site for installation or use by others.
2. Install: Fix in position for total operational use all apparatus as shown, specified or required. Provide all miscellaneous fittings and wiring supplies.
3. Or Approved Equal: Equipment or materials selected by Contractor subject to Engineer's acceptance.
4. Or Equivalent: Equipment or materials selected by Contractor matching the function and performance of equipment or materials listed.
5. Provide: Furnish and install in place, total and operational.
6. Complete/Completely: All pipes, fittings, ducts, wiring supplies, and accessories provided for the noted equipment from the equipment to the mains or noted termination points.

1.02 SCOPE OF WORK

- A. The work covered by this Division consists in furnishing all labor, equipment, accessories and materials and in performing all operations necessary for the installation of the HVAC systems, in strict accordance with Division 23 of this Specification and applicable Drawings and subject to the terms and conditions of the Contract.
- B. Work of this Division is subject to requirements of Instructions to Bidders, General Conditions, Supplementary Conditions, Division One, and all other sections of this Specification.
- C. Examine site and all Contract documents prior to submittal of bid.

1. Submittal of a Bid shall indicate the Contractor has examined the Site and Drawings and has included all required allowances in this Bid. No allowance shall be made for errors resulting from the Contractor's failure to visit job sites and to review Drawings.
- D. Division 23 Work: Includes, but is not limited to, providing the following:
 1. Hydronic Heating System: Piping, plant equipment, fuel supply, heating equipment.
 2. Hydronic Cooling System: Piping, plant equipment, cooling equipment.
 3. Direct Expansion (DX) System: Piping and equipment.
 4. Air Distribution System: Equipment and ductwork.
 5. Ventilation and Exhaust System: Equipment and ductwork.
 6. Building Automation System.
 7. Insulation System: Ductwork and piping.

1.03 ALTERNATES

- A. Refer to Division 1 for alternates.

1.04 CONTINGENCY

- A. Refer to Division 01 for amount to include in Mechanical Bid.

1.05 SUBMITTALS

- A. General:
 1. Preferred Submittal Format: PDF, unless otherwise noted.
 2. Preferred Submittal Nomenclature: Unless otherwise noted, PDF submittals are to be named according to the following:
 - a. [Specification Section Number] – [Specification Name or Equipment Included]
 3. Distribution: Unless otherwise noted, direct all correspondence concerning Division 23 submittals to:
 - a. Caleb Bulow
 - b. PRAIRIE ENGINEERING, P.C.
 - c. 1905 17TH STREET SE
 - d. MINOT, ND 58701
 - e. cbulow@prairieengineeringpc.com
- B. Substitution and Prior Approval to Quote:
 1. Format and Content: Complete descriptive technical data on the proposed item consisting of model numbers, type, size and performance characteristics.
 2. Submission Timing: Minimum of 192 hours (eight days) prior to bid opening.
 - a. Substitutions will not be permitted after bid opening except where such substitution is considered by the Engineer to be in the best interest of the Owner.
 3. Bidder Notification: Prior to bid opening via Addenda, sent to all planholders.
 4. Contractor Responsibility: This contractor will be responsible for all coordination, construction costs, and Architectural/Engineering design fees required to substitute equipment that has different characteristics than designed including weights, physical dimensions, clearances, mechanical characteristics, electrical characteristics, and other characteristics deemed important to the design by the Architect/Engineer.
 5. Alternative Format: Printed paper, two copies; Self-addressed, stamped envelope required for return reply.
- C. Schedule of Values
 1. Distribution: One copy to Engineer.

2. Format and Content: When included with the Bid, at minimum the following categories shall be indicated:
 - a. "Project mobilization"
 - b. "Start-up and Commissioning"
 - c. "Demolition"
 - d. "Excavation and Backfill"
 - e. "Insulation"
 - f. "Test and Balance"
 - g. "Building Automation System"
 - h. "Fire Sprinkler System"
 - i. "Piping Systems" (all hot/chilled/geothermal piping, valves, fittings, hangers, installed in place)
 - j. "Sheet Metal" (all ductwork, lining, dampers, hangers, installed in place)
 - k. "Terminal Units" (unit heaters, grilles, diffusers, radiation, installed in place)
 - l. "Hydronic Distribution Equipment" (all pumps, boilers, chillers, heating/cooling coils, installed in place)
 - m. "Air Distribution Equipment" (all fans, air handlers, heat pumps, VAVs, installed in place)
 3. Submission Timing: Prior to first payment application.
- D. Shop Drawings
1. Distribution: Engineer via the Prime Contractor for each item indicated.
 2. Format and Content: Include catalog numbers, performance data, dimensions and other descriptive information.
 - a. Contractor Review: Dated and signed cover sheet or review stamp for each Shop Drawing file to indicate thorough review. Email message text not acceptable.
 - b. Submit a separate shop drawing file for each Specification Section including only the items within that Section.
 - c. Non-Conforming: Returned to Contractor without review.
 3. Submission Timing: Prior to delivery of materials to job site.
- E. Record Drawings
1. Format and Content: Paper copy of Drawings project site.
 - a. As work progresses, Contractor's field supervisor shall mark Record Drawings in red pencil to indicate actual conditions of installation.
 - b. Give particular attention to marking actual locations of underground piping.
 - c. Affix all addendum and change order descriptions to appropriate record drawing sheet, utilizing spray adhesive.
 - d. Make Record Drawings available to Engineer during project visitation.
 2. Submission Timing: Close of project with Record Manuals.
- F. Spare Equipment and Devices
1. Distribution: Owner.
 2. Format and Content: List quantities on contractor letterhead or invoice, obtain signature of Owner's representative acknowledging receipt, and include with each Record Manual.
 3. Submission Timing: Close of project with Record Manuals.
- G. Operation and Maintenance Manuals
1. Submission Timing: Close of project, as condition of its acceptance.

2. Record Manual information shall be included for all equipment/material where Shop Drawings are required.
3. Format and Content: Two copies, Loose-leaf hardcover binders, and in PDF format on CDs or USB drive.
 - a. List project name, date, Contractor's name, address and telephone number on exterior label of each Record Manual and CD.
 - b. Include an index sheet indicating subcontractor and subcontractor's phone number and each major piece of equipment, supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
 - c. Include a copy of the Shop Drawings.
 - d. Include all installation, operation and maintenance data packaged with any equipment.
 - e. Include all signed and dated final punch lists from walkthroughs performed by the Engineer.

1.06 APPLICATIONS FOR PAYMENT

- A. Refer to Division 1 "Applications for Payment".
- B. Provide one additional copy, sent directly to the Engineer.
- C. Schedule of Values: At minimum, include items in Submittal article.

1.07 CHANGES TO CONTRACT

- A. Any required changes to the contract after bid date shall be in accordance with General Conditions/Division 1 and this section. Where any discrepancies between the sections are encountered, the more restrictive section shall apply.
- B. Proposed changes shall be accompanied with complete substantiating documentation.
 1. Provide an itemized list of quantities for materials, equipment, and supplies.
 - a. Include unit costs for each item and extended price.
 - b. Include unit labor for each item and extended time.
 2. Provide subcontractor proposals that include the same substantiating documentation.
 3. Provide quotations from suppliers for any specially ordered equipment.
- C. Material costs shall be actual costs to the contractor, obtaining the materials through normal supply channels, including trade and quantity discounts. Utilizing "suggested pricing" from national pricing organizations for unit costs shall not be accepted. Upon request, the contractor or subcontractor shall submit evidence to substantiate the costs.
- D. Labor units shall be industry accepted standard labor hours to perform one unit of work. If the work is being performed in a location that is not considered to be standard working conditions for that specific task, additional labor shall be itemized.
- E. Labor rates shall be the actual rate paid for the workman category along with associated labor burden. Labor burden shall consist only of the mandatory fringe benefits, labor taxes, and labor insurances as affected by payroll. The owner reserves the right to reject any labor burden which is inconsistent with other similar contractors or where the fringe benefit cost is in excess of established labor agreements.
- F. Subcontractors shall compute their costs in the same manner as the contractor. Subcontractors are subject to the same markup constraints as described herein.
- G. For changes resulting in credit to the costs, no restocking fees for materials shall be applied by the contractor or subcontractors.

1.08 QUALITY ASSURANCE

- A. Qualifications of Installers

1. For installation and testing, use only trained licensed and experienced workmen familiar with items required and manufacturer's recommended methods.
2. In acceptance or rejection of installed work, no allowance will be made for lack of skill on the part of the workmen.

1.09 AUTHORITIES AND AGENCIES

- A. Materials, workmanship and installation: comply with the latest editions of all applicable codes, local ordinances, industry standards, utility company regulations, insurance carrier requirements and these Specifications.
- B. Obtain and pay all permits, inspections, licenses and other charges pertaining to the Work. Upon completion of the Work, furnish proof of acceptance by proper agency having jurisdiction.
- C. Codes and standards shall include, but not necessarily be limited to, the following:
 1. International Energy Conservation Code (IECC);
 2. Uniform Plumbing Code;
 3. North Dakota State Building Code;
 4. International Building Code (IBC);
 5. International Mechanical Code (IMC);
 6. International Fuel Gas Code (IFC);
 7. National Fire Protection Association (NFPA) – Sections as adopted by authority having jurisdiction.
- D. The more stringent provisions shall govern where provisions of pertinent codes and standards conflict with these Specifications or Drawings. Where Codes, Specifications or Drawings differ with one another, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies to the Engineer immediately.
 1. Pertinent codes and standards shall not be cited to furnish less than specifically shown or specified.
 2. Meeting the minimum standards of the above Codes does not permit a lower grade of construction where Plans or Specifications call for workmanship or materials in excess of Code Requirements.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.10 GUARANTEE AND WARRANTY

- A. Except where otherwise noted, contractor shall guarantee materials, workmanship and the proper operation of equipment for a period of one year after Owner's beneficial use of the building or mechanical system. Contractor shall correct all equipment, material and workmanship found to be defective or non-conforming to the contract documents without cost to Owner during that one year period.
- B. Guarantee shall include trips to the project site by Contractor to adjust mechanical equipment as required, ensuring it is operating as intended.
- C. Specified guarantee shall not relieve Contractor from liability arising from improper installation or non-compliance with applicable codes.

1.11 TEMPORARY FACILITIES

- A. Refer to Special Conditions and/or Division 1 for details of temporary facilities.

1.12 NOMENCLATURE

- A. Pipe sizes listed are nominal pipe sizes throughout this Division except where otherwise noted.

PART 2 PRODUCTS

2.01 MATERIAL

- A. Material and equipment shall be as shown or specified. Provide material not specifically described but required for a complete and proper installation of the Work, subject to the acceptance of the Engineer.
- B. Owner will not be liable for material installed in non-compliance with codes, standards, and these Contract Documents.
- C. Fire Stop System material shall be by 3M "Fire Barrier", Metacaulk, Hilti, Nelson Firestop Products, or AD Fire.
- D. See Division 07 for further details on approved materials.

2.02 ELECTRIC WIRING

- A. The Division 23 Contractor shall furnish all motors, special controls and electrical devices as specified herein for proper operation of the equipment furnished.
- B. Division 26 Contractor shall furnish and install, as required, disconnects, starters, switches, etc., and do all necessary power and control wiring including the installation of electrical devices such as thermostats, humidistats, remote control panels, etc., furnished separately by Division 23 Contractor, unless otherwise noted in Equipment Specifications or noted in Section 230900.

PART 3 EXECUTION

3.01 GENERAL

- A. Engineer, Architect, or Owner shall not be responsible for the means, methods, techniques, sequences or procedures of construction selected by Contractor.
- B. Engineer, Architect, or Owner shall not be responsible for safety precautions and programs incidental to work of Contractor.
- C. It is the sole responsibility of Contractor to initiate, maintain, and supervise all safety precautions and programs in connection with the Work.
- D. In general, it is intended that ductwork and piping be installed parallel to building lines, unless otherwise shown on the Drawings, and that equipment be located symmetrical with the architectural elements of the building.

3.02 SURFACE CONDITIONS

- A. Prior to work of each Section of Division 23, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this Division may be installed in accordance with all pertinent codes, regulations and standards.

3.03 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Division before, during and after installation and to protect the installed work and materials of all other trades.
- B. Plugs: Install in ends of uncompleted piping at end of each day or when work stops.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

3.04 COORDINATION

- A. Order equipment and material in a timely fashion to assure it is on the job site when required.

- B. Coordinate installation of material with schedule of other trades to prevent unnecessary delay in construction schedule.
- C. Division 23 piping, duct and equipment installations shall comply with National Electrical Code requirements 110.26 "working spaces" and "dedicated spaces". Mechanical ducts and pipes shall not be installed in the space near electrical panels/equipment defined as "working spaces" or "dedicated spaces".

3.05 DISCREPANCIES, CONSTRUCTION CONFLICTS AND DRAWINGS

- A. Discrepancies
 - 1. Prior to submitting bid, Contractor shall refer any apparent discrepancies or omissions to Engineer for clarification.
 - 2. The Architect, Engineer or Owner will not be responsible for any oral instructions or modifications to the contract documents prior to opening of bids.
 - 3. Written interpretation or clarification will be made by Addenda.
- B. Construction Conflicts
 - 1. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision.
 - 2. Do not proceed with installation in area of question until conflict has been fully resolved.
 - 3. When so directed by Engineer, Contractor shall make minor adjustment to avoid interferences with other trades. Such minor adjustments shall be performed at no additional cost to the Architect, Engineer or Owner.
- C. Drawings
 - 1. Drawings indicate extent and general layout of mechanical systems for project. Due to small scale, it is not possible to indicate all fittings and accessories that may be required. Provide such fittings and accessories as required to form a complete and operating system in general conformance with Specifications and Drawings.
 - 2. Exact locations, distances, levels and other conditions will be governed by the structure. Field measurements shall take precedence over the Drawings. Use the Drawings and these Specifications for guidance. Secure the Architect's approval for all changes in locations.
 - 3. Verify all measurements at site. No compensation will be made because of difference between locations shown on the Drawings and measurements at the building.
 - 4. Refer to the architectural drawings for dimensions and locations of walls, partitions, doors, windows, ceiling heights, door swings and other details of construction.

3.06 UNDERGROUND UTILITIES

- A. Locations of existing underground utilities are based on available site information and are shown approximately. Contractor shall determine exact utility locations before commencing work and shall be responsible for repair of damages resulting from his construction activities to pre-construction condition.
- B. Trench and backfill for installation of underground piping to depth shown or required. Remove any accumulated water in excavation by pumping. Shore and brace excavation as required by safety regulations. Provide temporary bridges to maintain normal traffic flow. Excavation and backfill required by mechanical installations shall be accomplished in accordance with Division 31 Specifications by this Contractor.

3.07 REMOVAL AND/OR REUSE OF EXISTING MATERIALS AND EQUIPMENT

- A. Existing equipment, which is indicated as being removed and not indicated for reuse, shall remain the property of the Owner, stored as directed. Any material the Owner does not wish to retain shall be removed and disposed by the Contractor.
- B. Contractor shall assume in his Bid that existing equipment and materials shown to be reused are in good working condition and can be installed without any repairs. If certain items are found to be in need of repair or in unusable condition, Contractor shall notify the Engineer for decision, however, Contractor shall be responsible for any damage by his personnel to equipment in removal or handling.
- C. All refrigeration equipment and piping to be removed or relocated shall have the refrigerant removed prior to removal or demolition. Removal and reclamation of refrigerant shall be done by qualified, trained and certified refrigeration technicians. Certification shall meet all requirements as set forth by Section 608 of the Clean Air Act Amendments. Contractor shall use approved recovery and reclaiming equipment and approved containers for refrigerant storage. Flashing refrigerant gas to atmosphere is strictly prohibited.
- D. Material and other equipment removed and to be reused shall be cleaned before reinstallation.

3.08 OFFSETS

- A. Where required to allow clearance of electrical conduit and outlet boxes, beams, etc., to avoid interference with work of other trades, to increase head room under mechanical systems or to improve the appearance of mechanical systems work, this Contractor shall offset his mechanical system as directed by the Architect/Engineer.

3.09 CUTTING AND PATCHING

- A. Refer to General Conditions. Unless specifically called out to be performed by other Contractors, the Division 23 Contractor shall perform all cutting and patching required for the installation of material and equipment furnished under his Contract.
- B. Opening/holes cut to allow passage of ducts and pipes through concrete floor shall be patched by the Contractor doing the cutting unless indicated otherwise on the Drawings.
- C. Fire-Barrier Penetrations
 - 1. Pipe penetrations through fire rated walls and floors shall be sealed with a UL classified Fire Stop System. Fire Stops shall be provided in accordance with the appropriate System No. as it relates to pipe size/Material and wall or floor rating/material.
 - 2. See Specification Section 230510 for other Fire-Barrier Penetration requirements.
 - 3. See Section 2 article "Materials" of this Specification for approved fire stop system material.
- D. Openings between ductwork and fire rated walls and floors shall be sealed with fire rated caulking or steel collars on both sides of wall or floor.
- E. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all cost.
- F. Use only rotary type drilling tools to cut concrete.
- G. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.10 FIELD QUALITY CONTROL

- A. Perform field tests and inspections. Test new piping and parts of existing piping that have been altered, extended, or repaired.

- B. Ceiling Inspection: An above ceiling inspection by the Architect/Engineer shall take place prior to the installation of the ceiling, to ensure that everything is properly sealed, accessible, and fire sealed if required.
- C. Low Pressure Hydronic Piping Tests: Maintain constant pressure.
 - 1. Pressure: Minimum of 100 psig.
 - 2. Duration: One hour.
- D. Gas Piping Tests:
 - 1. Test gas piping as required by the Authority Having Jurisdiction or the Utility Company.
 - 2. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- E. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained. Piping will be considered defective if it does not pass tests and inspections.

3.11 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.12 CLEANING

- A. Clean interior of duct and piping systems. Remove dirt and debris as work progresses.
- B. The hydronic water systems shall be cleaned as follows:
 - 1. The Division 23 Contractor shall arrange for the services of the local area Chemsearch or Garrett-Callahan water treatment specialist to help with chemically cleaning the new piping systems.
 - 2. Division 23 Contractor shall utilize Garrett-Callahan Formula 247 to degrease, descale and generally clean the piping according to the recommendations of the company specialist. After completion of this work, the Contractor shall add the proper quantity of Garrett-Callahan Formula 12L corrosion inhibitor or provide a Nitrite residual of 500-1000 ppm. Equivalent products by Chemsearch, Dearborn, Brentag, or Agassiz Chemical are acceptable.

3.13 INSTRUCTIONS

- A. Provide written and oral operating and maintenance instructions to Owner's representatives. The oral instructions shall be given before the Owner occupies the buildings. Instructions to include all building's mechanical systems and equipment.
- B. Copies of written operating and maintenance instructions shall be included with each Record Manual.
- C. Division 23 Contractor shall coordinate with Owner at Owner's convenience, formal instruction time for contractor personnel to instruct Owner's Representatives on all equipment. Provide similar equipment supplier's instructions where specified thus.
- D. Formal instructions shall be video recorded when required by other Sections of this Specification by this Contractor. Format shall be DVD. Formal instruction to be included with each Record Manual, being referenced to and a part of the Manual.

3.14 CLEAN UP

- A. Each Contractor shall be responsible for cleaning up after his work, including the removal of all scrap material left on the job by his men or Subcontractors. This will include the removal of all pipe and sheet metal cuttings, pieces of sheet metal, pipe, and insulation and other debris.
- B. Clean all heating units, clean and straighten fins on all coils, clean scale, dirt or debris off piping, motors, etc., oil or grease all motors, fan bearings, pump gear boxes, etc., and leave in a clean best possible working condition. Install clean filters in ventilation system prior to turning job over to Owner.
- C. After all tests have been made and the mechanical systems are operating properly, this Contractor shall go over the entire system and remove labels from all mechanical equipment.
- D. All equipment having finished paint surfaces shall be examined upon completion for scratches and other damage. Touch up all surfaces as required with paint of color to match factory finish.
- E. Perform all cleaning as required by other Sections of Division 23.

END OF SECTION

SECTION 23 0517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

- A. Vertical Piping:
 - 1. Sleeve Length: 1 inch above finished floor.
 - 2. Provide sealant for watertight joint.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Partitions, and Beam Flanges: 1 inch greater than external pipe diameter.
 - 3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Provide sleeves when penetrating concrete footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Aboveground Piping:
 - a. Pack solid using mineral fiber in compliance with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
 - 2. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
 - 3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

- E. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

END OF SECTION

SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tags.
- B. Adhesive-backed duct markers.
- C. Stencils.
- D. Pipe markers.
- E. Ceiling tacks.

1.02 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS

- A. Automatic Controls: Tags. Key to control schematic.
- B. Ductwork: Stencils or adhesive-backed labels.
- C. Heat Transfer Equipment: Nameplates.
- D. Major Control Components: Nameplates.
- E. Piping: Stencils or adhesive-backed labels.
- F. Small-sized Equipment: Tags.
- G. Balance Valves: Tags.

2.02 NAMEPLATES

- A. Letter Color: White.
- B. Letter Height: 1/4 inch.
- C. Background Color: Black.

2.03 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.04 ADHESIVE-BACKED DUCT MARKERS

- A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.
- B. Style: Individual Label.

2.05 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
 - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
 - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.

3. 2-1/2 and up Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
4. Ductwork and Equipment: 2-1/2 inch high letters.

2.06 PIPE MARKERS

- A. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

2.07 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- F. Use tags on piping 3/4 inch diameter and smaller.
 1. Identify service, flow direction, and pressure.
 2. Install in clear view and align with axis of piping.
 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Install ductwork with labels. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- H. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.02 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.03 PROJECT CONDITIONS

- A. Partial Owner Occupancy: Owner may occupy completed areas of building before completion of test and balance. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.04 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.05 QUALITY ASSURANCE

- A. Division 23 Contractor shall employ an independent TAB Contractor specializing in total system air and hydronic testing and balancing.
 - 1. All personnel involved in the execution of the work under the TAB Contract shall be experienced and factory-trained specifically in the total balancing of mechanical systems, as well as being regular employees of the TAB Contractor.
- B. The following contractors have been pre-approved to bid the TAB work:
 - 1. Air Dynamics; Granville, ND.
 - 2. Balancing Professionals; Fargo, ND.
 - 3. CL Linfoot; Grand Forks, ND.
 - 4. Design Control, Inc.; Fargo, ND.
 - 5. McFarlane, Inc.; Grand Forks, ND.
- C. Calibrate all instruments and provide verification of calibration provided with submittal data.

1.06 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Engineer and for inclusion in operating and maintenance manuals.

3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
6. Include the following on the title page of each report:
 - a. Name of Testing, Adjusting, and Balancing Agency.
 - b. Address of Testing, Adjusting, and Balancing Agency.
 - c. Telephone number of Testing, Adjusting, and Balancing Agency.
 - d. Project name.
 - e. Project location.
 - f. Project Engineer.
 - g. Project Contractor.
 - h. Report date.
- C. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

1.07 WARRANTY

- A. The TAB agency shall provide an extended 90-day warranty after the completion of the TAB work, during which time the Owner or Engineer can request a rebalancing and retesting of any component listed in the report. The TAB agency shall provide a technician to assist the Owner and/or Engineer in making any tests they may require during this time period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 1. AABC (NSTSB), AABC National Standards for Total System Balance.
 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 3. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.

- 11. Duct system leakage is minimized.
- 12. Hydronic systems are flushed, filled, and vented.
- 13. Proper strainer baskets are clean and in place.
- 14. Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 GENERAL PROCEDURES

- A. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- B. Verify interlocked systems are operating in conjunction.
- C. Take and report testing and balancing measurements in inch-pound (IP) units.
- D. Report deficiencies discovered before and during performance of testing, adjusting and balancing procedures.
- E. Provide assistance to mechanical contractor to troubleshoot systems with deficiencies outside the allowable limits set in this Specification.

3.06 AIR SYSTEM PROCEDURE

- A. Cut insulation for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. Install and join new insulation that matches removed materials.
- B. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts. Rubber or metal snap-in plugs are also acceptable.
- C. Adjust new and modified air handling equipment and distribution systems to provide required or design supply, return, and exhaust air quantities.
- D. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- E. Measure air quantities at air inlets and outlets.
- F. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

- G. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- H. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- I. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- J. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- K. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- L. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- M. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.
- N. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- O. For belt-drive fans with VFD's, sheave fan as required to attain the design airflow with the VFD set at 60 Hz. Fan VFD shall not be used to balance the airflow.
- P. Test and adjust all fresh air quantities to individual heat pumps.
- Q. Verify that thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and heat generating appliances.

3.07 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities for new equipment, relocated equipment, and existing equipment in Area A.
 - 1. Where pumps are controlled by VFD's, use VFD to balance water flow.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
- G. Verify strainers have been flushed until free of all sediment.
- H. Verify that startup screens are replaced by permanent screens with indicated perforations.

3.08 EXISTING SYSTEMS

- A. Perform an inspection of existing equipment that is to remain and be reused.
 - 1. Measure and record the operating speed, airflow, and static pressure of each fan.

2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Compare the indicated airflow of the renovated work to the measured fan airflows.
 - C. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
 - D. Balance each air outlet.

3.09 SCOPE

- A. Existing systems:
 1. Relocated heat pumps.
 2. Existing VAV's which are part of the RTU-2 system.
 3. RTU-1 system, including VAV's.
 - a. Under alternate bid. See alternate schedule.
 4. HP-5 and attached system.
 5. Existing hydronic heating system downstream of existing water-to-water heat pump.
- B. New systems: All components listed below.
- C. Test, adjust, and balance the following:
 1. Packaged Roof Top Heating/Cooling Units.
 2. Air Coils.
 3. Terminal Heat Transfer Units.
 4. Fans.
 5. Air Terminal Units (VAV's).
 6. Air Inlets and Outlets.

3.10 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
 1. Manufacturer.
 2. Model/Frame.
 3. HP/BHP.
 4. Phase, voltage, amperage; nameplate, actual, no load.
 5. RPM.
 6. Sheave Make/Size/Bore.
- B. Air Cooled Condensers:
 1. Identification/number.
 2. Location.
 3. Manufacturer.
 4. Model number.
 5. Serial number.
 6. Entering DB air temperature, design and actual.
 7. Leaving DB air temperature, design and actual.
 8. Number of compressors.
- C. Cooling Tower:
 1. Tower identification/number.
 2. Manufacturer.

3. Model number.
 4. Serial number.
 5. Rated capacity.
 6. Ambient air DB temperature.
 7. Condenser water entering temperature.
 8. Condenser water leaving temperature.
 9. Condenser water flow rate.
 10. Fan RPM.
- D. Heating Coils:
1. Identification/number.
 2. Location.
 3. Service.
 4. Manufacturer.
 5. Air flow, design and actual.
 6. Water flow, design and actual.
 7. Entering water temperature, design and actual.
 8. Leaving water temperature, design and actual.
 9. Entering air temperature, design and actual.
 10. Leaving air temperature, design and actual.
- E. Electric Duct Heaters:
1. Manufacturer.
 2. Identification/number.
 3. Location.
 4. Model number.
 5. Design kW.
 6. Number of stages.
 7. Phase, voltage, amperage.
 8. Test voltage (each phase).
 9. Test amperage (each phase).
 10. Air flow, specified and actual.
 11. Temperature rise, specified and actual.
- F. Air Moving Equipment:
1. Location.
 2. Manufacturer.
 3. Serial number.
 4. Arrangement/Class/Discharge.
 5. Air flow, specified and actual.
 6. Return air flow, specified and actual.
 7. Outside air flow, specified and actual.
 8. Total static pressure (total external), specified and actual.
 9. Sheave Make/Size/Bore.
 10. Number of Belts/Make/Size.
 11. Fan RPM.
- G. Exhaust Fans:
1. Location.

2. Manufacturer.
 3. Model number.
 4. Serial number.
 5. Air flow, specified and actual.
 6. Total static pressure (total external), specified and actual.
 7. Sheave Make/Size/Bore.
 8. Number of Belts/Make/Size.
 9. Fan RPM.
- H. Terminal Unit Data:
1. Manufacturer.
 2. Type, constant, variable, single, dual duct.
 3. Identification/number.
 4. Location.
 5. Model number.
 6. Size.
 7. Minimum static pressure.
 8. Minimum design air flow.
 9. Maximum design air flow.
 10. Maximum actual air flow.
 11. Inlet static pressure.
- I. Air Distribution Tests:
1. Air terminal number.
 2. Room number/location.
 3. Terminal type.
 4. Terminal size.
 5. Design air flow.
 6. Test (final) air flow.
 7. Percent of design air flow.
- J. Hydronic Systems:
1. Static water pressure at expansion tanks.
 2. Glycol Manufacturer
 3. Glycol Type
 4. Design and actual Concentration % by Weight or Temperature Protected to (°F.)

END OF SECTION

SECTION 23 0713 - DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Jacketing and accessories.

1.02 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- E. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- F. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.
- G. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- J. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- K. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.

2. Johns Manville: www.jm.com/#sle.
 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 5. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
- C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- F. Outdoor Vapor Barrier Mastic:
1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 GLASS FIBER, RIGID

- A. Manufacturer:
1. CertainTeed Corporation: www.certainteed.com/#sle.
 2. Johns Manville: www.jm.com/#sle.
 3. Knauf Insulation: www.knaufinsulation.com/#sle.
 4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
- C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 3. Secure with pressure-sensitive tape.
- D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
 2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 JACKETING AND ACCESSORIES

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
- B. Aluminum Jacket:
1. Manufacturers:
 - a. Childers Brand, Specialty Construction Brands, Inc.
 - b. Metal Jacketing Systems.
 - c. Substitutions: See Section 23 0500 - HVAC General Provisions .
 2. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.

3. Thickness: 0.016 inch sheet.
 4. Finish: Embossed.
 5. Joining: Longitudinal slip joints and 2 inch laps.
 6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
- C. Reinforced Tape:
1. FSK tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.
 2. Comply with UL 723 or ASTM E84.
 3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.
 4. Finish: Match insulation.

2.05 DUCT LINER

- A. Manufacturers:
1. Aeroflex USA: www.aeroflexusa.com/#sle.
 2. Armacell LLC: www.armacell.us/#sle.
 3. CertainTeed Corporation: www.certainteed.com/#sle.
 4. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
 5. Johns Manville: www.jm.com/#sle.
 6. Knauf Insulation: www.knaufinsulation.com/#sle.
 7. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 8. Substitutions: See Section 23 0500 - HVAC General Provisions .
- B. Elastomeric Foam Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
1. Minimum Service Temperature: Minus 40 degrees F.
 2. Maximum Service Temperature: 180 degrees F.
 3. Fungal Resistance: No growth when tested according to ASTM G21.
 4. Apparent Thermal Conductivity: Maximum of 0.28 at 75 degrees F.
 5. Minimum Noise Reduction Coefficients:
 6. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation. Comply with ASTM C916.
- D. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
1. Fungal Resistance: No growth when tested according to ASTM G21.
 2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
 3. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
 4. Minimum Noise Reduction Coefficients:
 - a. 1/2 inch Thickness: 0.30.
 - b. 1 inch Thickness: 0.45.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Provide insulation with vapor barrier jackets.
 2. Finish with tape and vapor barrier jacket.
 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated Ducts Conveying Air Above Ambient Temperature:
1. Provide with or without standard vapor barrier jacket.
 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor):
Finish with canvas jacket sized for finish painting.
- E. Duct and Plenum Liner Application:
1. Secure insulation with mechanical liner fasteners. Refer to SMACNA (DCS) for spacing.
 2. Seal and smooth joints. Seal and coat transverse joints.
 3. Seal liner surface penetrations with adhesive.
 4. Duct dimensions indicated are net inside dimensions required for airflow. Increase duct size to allow for insulation thickness.

3.02 WALL AND FLOOR PENETRATIONS

- A. Roof/Wall Penetrations: Install insulation continuously through roof/wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof/wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside flashing at least 2 inches.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- C. Fire-Rated Wall and Partition Penetrations:
1. Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
- D. Floor Penetrations:
1. For penetrations through fire-rated assemblies, insulate with same procedure as with Fire-Rated Walls.
- E. Fire-Barrier Penetrations:
1. Maintain indicated fire rating of walls, partitions, ceilings, and floors at duct penetrations. Seal duct penetrations with Approved firestop materials.

3.03 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07.

3.04 SCHEDULES

- A. Fiberglass wrap, with FSK jacket:
 - 1. Supply-Air Ducts and Plenums in attics, concealed spaces and unconditioned spaces.
 - 2. Tempered-Fresh-Air Ducts in attic spaces.
 - 3. Exhaust-Air Ducts and Plenums between isolation damper and penetration of building exterior.
 - a. Exception: Lined Exhaust-Air Duct from power roof ventilators.
 - 4. Mixed-Air Ducts and Plenums.
 - 5. Tempered-Fresh-Air Duct and Plenums in spaces other than attic.
 - 6. Un-tempered Fresh-Air Duct from air-to-air heat exchangers.
- B. Fiberglass board, welded board pins, with FSK facing and matching label-less FSK tape:
 - 1. Outdoor-Air Duct and Plenums.
 - 2. Ducts and Plenums in Mechanical Rooms with one of following means of sealing and cladding:
 - a. Mastic-canvas-mastic.
 - b. Mastic-fiberglass scrim cloth-mastic.
 - c. Self-adhering, peel and stick, rubberized bitumen jacket.
- C. Minimum Duct Insulation R-Values
 - 1. Supply ducts, installed in unheated attics and exterior: R-12.
 - 2. Supply ducts, installed in unconditioned spaces, ceiling plenums, and crawl spaces: R-6.
 - a. Exception: Cooling only supply ducts: R-2.
 - 3. Supply ducts, installed in attic with roof insulation: R-2.
 - 4. Return ducts, installed in unheated attics: R-4.
 - 5. Outside air ducts: R-12.
 - 6. Un-tempered Fresh-Air Ducts: R-4.
- D. Insulation not required:
 - 1. Exhaust-Air Duct except as otherwise
 - 2. Return-Air Duct and Plenums in indirectly conditioned spaces.
 - 3. Supply-Air Ducts and Plenums in exposed, conditioned spaces.
 - 4. Tempered-Fresh-Air Ducts.
 - 5. Fibrous-glass ducts.
 - 6. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 7. Factory-insulated flexible ducts.
 - 8. Factory-insulated plenums and casings.
 - 9. Flexible connectors.
 - 10. Vibration-control devices.
 - 11. Factory-insulated access panels and doors.

END OF SECTION

SECTION 23 0719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019, with Editorial Revision (2023).
- C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- E. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2023.
- F. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- I. SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth; 2016b.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com/#sle.
 - 2. Johns Manville Corporation: www.jm.com/#sle.
 - 3. Knauf Insulation: www.knaufinsulation.com/#sle.

4. Owens Corning Corporation: www.ocbuildingspec.com/#sle.
 5. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
1. K Value: ASTM C177, 0.24 at 75 degrees F.
 2. Maximum Service Temperature: 850 degrees F.
 3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.
- E. Indoor Vapor Barrier Finish:
1. Cloth: Untreated; 9 oz/sq yd weight.
 2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.03 JACKETING AND ACCESSORIES

- A. PVC Plastic.
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil, 0.010 inch.
 - e. Connections: Brush on welding adhesive.
- B. Aluminum Jacket:
1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
 2. Thickness: 0.016 inch sheet.
 3. Type: Factory-applied, self-adhesive jacketing.
 4. Finish: Embossed.
 5. Joining: Longitudinal slip joints and 2 inch laps.
 6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
 7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- C. Aluminum-Foil Laminate Jacket:
1. Factory-applied, pressure sensitive adhesive jacketing on paper release liner.
 2. Finish: Aluminum embossed.
 3. Comply with ASTM C1775.
- D. Reinforced Tape:
1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
 2. Comply with UL 723, ASTM E84.
 3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.

2.04 ACCESSORIES

- A. General Requirements:
1. Provide required accessories in accordance with and subject to the recommendations of the insulation manufacturer.

2. Furnish compatible materials which do not contribute to corrosion, soften, or otherwise attack surfaces to which applied, in either the wet or dry state.
3. Comply with ASTM C795 requirements for materials to be used on stainless steel surfaces.
4. Supply materials that are asbestos free.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated Pipes Conveying Fluids Below Ambient Temperature:
 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- C. Stencil or label the outside insulation jacket of each union with the word "union."
- D. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- G. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- H. Inserts and Shields:
 1. Application: Piping 1-1/2 inches diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- I. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
 1. At fire separations, terminate insulation at fire-rated wall and partition penetrations.
- J. Fire-Barrier Penetration Protection:
 1. Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
 2. Provide intumescent collars, wraps, fire bands, sealants, and other firestopping materials as required to maintain the fire ratings for the piping and insulation materials used.
 3. Install Fire Stop Systems per the manufacturers guidelines.

3.02 SCHEDULE

A. Heating Systems:

1. Heating Water Supply and Return: Fiberglass
 - a. 1-1/4 inch diameter pipe and smaller: 1-1/2 inches thick, R-6 minimum.
 - b. 1-1/2 inch pipe diameter and larger, 2 inches thick, R-8 minimum.

B. Cooling Systems:

1. Geothermal Water: Fiberglass: 1-1/2 inches thick, R-8 minimum.

END OF SECTION

SECTION 23 0913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control panels.
- B. Control Valves:
 - 1. Ball valves with factory-mounted actuators.
 - 2. Butterfly valves with factory-mounted actuators.
 - 3. Electronic valve operators.
- C. Dampers.
- D. Damper Operators:
 - 1. Electric operators.
- E. Wall-, Surface-, and Duct-Mounted Sensors:
 - 1. Temperature sensors.
 - 2. Static air pressure sensors.
 - 3. Airflow measuring devices.
- F. Thermostats:
 - 1. Freezestats.
- G. Fan and pump motor run-status monitoring.
- H. Pipe-Mounted Sensors and Transmitters:
 - 1. Temperature sensors.
 - 2. Pressure transmitters.
 - 3. Differential pressure transmitters.

1.02 REFERENCE STANDARDS

- A. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D. Project Record Documents: Record actual location of control components, including panels, thermostats, and sensors.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

- A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.
- B. NEMA EN 10250, general purpose utility enclosures with enameled finished face panel.
- C. Provide common keying for all panels.

2.03 CONTROL VALVES

- A. Ball Valves with Factory-Mounted Actuators:
 - 1. Service: Use for chilled water or hot water.
 - 2. Flow Characteristic: Include 2-way, 3-way diverting, and 3-way mixing operation configured to fail as indicated on drawings.
 - 3. Body Size:
 - a. Under 2-1/2 inches:
 - 1) Connection: NPT.
 - 2) Materials:
 - (a) Body: Brass.
 - (b) Flanges: Ductile iron.
 - (c) Ball: Chrome-plated brass.
 - (d) Stem: Nickel-plated brass.
 - (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
 - (f) Stem Seal: EPDM O-Rings.
 - (g) Flow Control Disk: Thermoplastic synthetic-resin.
 - b. 2-1/2 inches and Above:
 - 1) Connection Type: Flanged.
 - 2) Materials:
 - (a) Body: Brass.
 - (b) Flanges: Ductile iron.
 - (c) Ball: 300 series stainless steel.
 - (d) Stem: 300 series stainless steel.
 - (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
 - (f) Stem Seal: EPDM O-Rings.
 - (g) Flow Control Disk: Thermoplastic synthetic-resin.
 - c. Service Temperature:
 - 1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
 - 2) Ambient Side: From minus 40 to 131 degrees F.
 - 4. Actuator Requirements:
 - a. Assembly: Factory-mounted.
 - b. Input: Configured for proportional control.
 - c. Accessories: Provide with valve position indicator and manual override.
- B. Butterfly Valves with Factory-Mount Actuators:
 - 1. Iron body, bronze disc, resilient replaceable seat for service to 180 degrees F wafer or lug ends, extended neck.
- C. Electronic Valve Actuators:

1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
2. Select operator for full shut-off at maximum pump differential pressure.

2.04 DAMPERS

- A. See Section 23 3300 for dampers and this section for actuators and operators.

2.05 DAMPER OPERATORS

- A. General:

1. Provide actuators with torque capacity sized for minimum of 20 percent greater than maximum design stream velocity and hold tight seal against maximum system pressures.
2. Provide spring return for two position control and for fail safe operation.
3. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
4. Provide one operator for maximum 36 sq ft damper section.
5. Damper Position Indication: Electric switch type on two-position dampers to indicate fully open and fully closed. Provide where proof of position is required in sequence of operations.

- B. Electric Operators:

1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch where report indicated in sequence of controls.

2.06 WALL-, SURFACE-, AND DUCT-MOUNT SENSORS

- A. Temperature Sensors:

1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
2. Performance Characteristics:
 - a. RTD:
 - 1) Room Sensor Accuracy: Plus/minus 0.50 degrees F minimum.
 - 2) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
 - 3) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
 - 4) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
 - 5) Range: Minus 40 degrees F through 220 degrees F minimum.
 - b. Thermistor:
 - 1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
 - 2) Range: Minus 25 degrees F through 122 degrees F minimum.
 - 3) Heat Dissipation Constant: 2.7 mW per degree C.
 - c. Sensing Range:
 - 1) Provide limited range sensors if required to sense the range expected for a respective point.
 - 2) Use RTD type sensors for extended ranges beyond minus 30 to 230 degrees F.
 - 3) Use temperature transmitters in conjunction with RTDs when RTDs are incompatible with DDC controller direct temperature input.
3. Immersion Temperature Sensors: A sensor encased in a corrosion-resistant probe with an indoor junction box service entry body.
4. Room Temperature Sensors without Display:
 - a. Construct for wall box mounting.

- b. Blank cover plate, labeled.
- 5. Room Temperature Sensors with Integral Digital Display:
 - a. Construct for surface or wall box.
 - b. Indication of space and outdoor temperatures.
 - c. Setpoint adjustment to accommodate room setpoint.
 - d. Display and control fan operation status.
 - e. Manual occupancy override and indication of occupancy status.
- 6. Temperature Averaging Elements:
 - a. Use on duct sensors for ductwork 10 sq ft or larger.
 - b. Use averaging elements where prone to stratification with sensor length 8 ft or 16 ft.
 - c. Provide for all mixed air and heating coil discharge sensors regardless of duct size.
- B. Static-Air Pressure Sensors:
 - 1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
 - 2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
 - 3. Accuracy: One percent of full scale with repeatability 0.3 percent.
- C. Air Filter Switches: Differential pressure switches, automatic reset.
 - 1. Provide appropriate scale range and differential adjustment for intended service.
- D. Air Pressure Safety Switches: Manual reset with appropriate scale range and differential adjustment for intended service.
- E. Airflow Measuring Devices: Capable of continuous measurement of air volume.
 - 1. Single or multiple airflow elements, factory mounted and pre-piped in casing designed for connection to ductwork. Multiple elements shall be manifolded together.
 - 2. Probes shall contain multiple total and static pressure sensors placed at concentric area centers along the exterior surface of the cylindrical probes and internally connected to their respective averaging manifolds.
 - 3. Traverse probes shall have symmetrical averaging signal takeoffs and shall be of aluminum construction with hard anodized finish with galvanized steel mounting hardware and shall not significantly impact fan performance or contribute to fan generated noise levels.
 - 4. Performance: +/- 5% of reading, calibrated for suitable air velocity.

2.07 THERMOSTATS

- A. Low-Limit Temperature Cutout Switch: Manual reset, triggering on low temperature as sensed by any 18" maximum section.
 - 1. Configuration: Vapor-filled capillary.
 - 2. Probe Sensing Length: 1 foot long for each square foot of coil area.
 - 3. Setpoint Adjust Control: Screw with manual reset switch.
 - 4. Switch Type: SPDT, snap-action, form C in dust-protected enclosure.
 - 5. Mounting: Locate on cooling coil intake side.

2.08 FAN AND PUMP MOTOR RUN-STATUS MONITORING

- A. Current Switches:
 - 1. Mini Solid-Core: 2-State, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure.
 - 2. Solid Core: 2-state, On/Off digital output of motor status with adjustable trip point to detect belt loss or mechanical failure and built-in pilot duty relay.

3. Maximum AC Current Monitoring Value: As indicated on drawings.
- B. Differential Pressure Switches:
 1. Fan Status: Select for adjustable range suitable for application across fan discharge and external or fan inlet. Include static pressure tips.
 2. Pump Status: Select for adjustable range suitable for application across pump discharge and suction sides. Include static pressure tips and 3-way valve manifold.

2.09 PIPE-MOUNTED SENSORS AND TRANSMITTERS

- A. Temperature Sensors:
 1. Pipe-mounted temperature probe tied to weather-resistant enclosure for direct insertion into compatible liquids or gases or inserted into intermediary thermal grease-filled pipe-well compatible with interfaced fluid.
 2. Thermistor type with 24" lead; strap on to pipe under insulation.
- B. Pressure Transmitters:
 1. Self-contained transducer for monitoring of pneumatic, gas, liquid, or steam service with proportional range scaled over selected electronic output.
 2. Service Monitoring Range: 0 to 15 psig.
 3. Wetted Material: Brass for general service or stainless steel for steam and corrosive.
 4. Stainless-steel diaphragm construction; minimum 150-psig operating pressure.
- C. Differential Pressure Transmitters:
 1. Stainless-steel diaphragm construction; minimum 150-psig operating pressure and tested to 300-psig.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 48 inches above floor. Align with lighting switches and humidistats; see Section 26 2726.
- C. If any device, fixture, or panel is required to be wall mounted by this contractor, provide AC Plywood, 3/4" or 5/8" thickness, painted both sides with fireproof paint, color to be determined and coordinated with owner. Paint is required even if installed on a non-fire rated wall.
- D. Mount freeze protection thermostats using flanges and element holders.
- E. Provide separable sockets for liquids and flanges for air bulb elements.

- F. Provide valves with position indicators and with pilot positioners where sequenced with other controls.
- G. Provide mixing dampers of opposed blade construction arranged to mix streams. Provide pilot positioners on mixed air damper motors.
- H. Install damper motors on outside of duct in warm areas. Do not install motors in locations at outdoor temperatures.
- I. Install "hand/off/auto" selector switches to override automatic interlock controls when switch is in "hand" position.
- J. Mount duct mount sensors in an electrical box through a hole in the duct and position to be easily accessible for repair or replacement.
- K. Mount low temperature limit switches horizontally across duct in accordance with manufacturers recommended installation procedures. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream. Install averaging elements in ducts and plenums in crossing or zigzag pattern. Protect averaging or capillary tubes where they penetrate duct with rubber grommet and seal with clear silicon. Support with capillary clips and maintain minimum 1 inch tubing bending radius.
- L. Differential pressure sensors used to control equipment such as fans and pumps shall be connected directly to the same controller that controls the equipment to ensure the continued proper operation of the controlled equipment without dependence on the control network.
- M. Calibrate current switches to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.
- N. Airflow Station: Install grid array in ductwork where shown. Provide gasket between frame and duct. Install in accordance with manufacturer's instructions.

3.03 CONTROL PANELS

- A. Locations shown on the drawings are recommended locations and do not indicate actual quantity or location. Generally, locate all panels in mechanical and electrical rooms. Control panels will not be installed in public areas unless otherwise noted. Control panels will not be recessed installed on an exterior wall where condensation can accumulate in panel.
- B. Mount control panels adjacent to associated equipment on vibration free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
- C. All control devices located in exposed areas subject to outside weather conditions shall be mounted inside weatherproof enclosures. Location of each panel shall be convenient for adjustment service.
- D. Engraved nameplates shall be provided beneath each panel face mounted control device describing the function of each device.
- E. All electrical devices within the panel shall pre-wired to terminal strips with all inter-device wiring within the panel completed prior to installation of the system.

3.04 IDENTIFICATION

- A. Major Equipment: Provide label with associated DDC point name. Major equipment includes all mechanical equipment scheduled on the Drawings.
- B. Misc. Switches or Other Special Function Devices: Provide phenolic labels with indication of device function or as directed on the Drawings.
- C. Room Sensors: Provide label indicating equipment controlled by sensor.

3.05 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Division 26.
- B. Install building wire and cable according to Division 26.
- C. Install signal and communication cable according to Division 27.
- D. All junction boxes, junction box covers and raceway systems except those embedded directly in earth or concrete, or surface metal raceway systems (wiremold), shall be externally identified by permanent bright blue paint suitable for the purpose, to easily distinguish from other communication or power raceway systems. Items shall be painted prior to installation. In addition to field painted conduit, factory painted conduit as manufactured by Allied Tube & Conduit (Data Com Blue Steel EMT), acceptable.
- E. Provide conduit where cables are concealed in walls, in mechanical rooms, and in rooms without ceilings.
 - 1. All control wiring in exposed, accessible or in inaccessible areas in Nursing Home, Patient Care and Hospital facilities, and Dormitories with an occupancy of 16 people or greater shall be run in conduit.
- F. Bundle and harness exposed multiconductor instrument cable in place of single cables where several cables follow a common path.
- G. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
- H. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
- I. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- J. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- K. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- L. The Temperature Control Contractor shall provide any line voltage wiring required for local or central control panels. Power may be extended from the nearest receptacle circuit or spare circuit breaker in nearest normal power panel.
- M. The Division 26 Contractor shall furnish all power wiring to electrical starters and motors.

3.06 SCHEDULES

- A. Room Sensor Schdule:
 - 1. Room Temperature Sensor, Blank Plate: Public areas such as corridors, toilet rooms.
 - 2. Room Temperature Sensor, Display: Limited access areas such as classrooms, offices.

END OF SECTION

SECTION 23 0923 - DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. System description.
- B. Operator interface.
- C. Controllers.
- D. Power supplies and line filtering.

1.02 RELATED REQUIREMENTS

- A. Section 23 0913 - Instrumentation and Control Devices for HVAC.
- B. Section 23 0993 - Sequence of Operations for HVAC Controls.

1.03 REFERENCE STANDARDS

- A. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2022h, with Editorial Revision.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for each system component and software module.
- C. Shop Drawings:
 - 1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
 - 2. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
 - 3. Indicate description and sequence of operation of operating, user, and application software.
 - 4. Damper schedule.
 - 5. Control valve schedule.
- D. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
 - 1. Revise shop drawings to reflect actual installation and operating sequences.
- E. Operation and Maintenance Data:
 - 1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
 - 2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
 - 3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

- A. Perform work in accordance with NFPA 70.

- B. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.
- C. Contractors pre-approved to bid the work in this section:

1.06 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and service necessary for a complete and operating Building Automation System (BAS), utilizing Direct Digital Controls (DDC) for energy management, equipment monitoring and control, and subsystems as defined in Project Documents. In general, all material and equipment used shall be standard components, regularly manufactured and available and not custom designed especially for this project.
 - 1. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers.
 - 2. This is an existing facility and will require interface with an existing control system and the existing host computer system.
 - 3. Remove all controls related pneumatic tubing and electrical conduit that is not reused as part of the new direct digital control and monitoring system.
 - 4. Patch holes in existing ductwork at removed sensors that are not reused, with sheet metal patches of equal gauge or heavier. Seal airtight with adhesive and then screwed or pop riveted to the ductwork.
- B. Following divisions of work are generally applicable unless otherwise noted.
 - 1. ATC contractor provides:
 - a. All controllers, control devices, control panels, controller programming, controller programming software.
 - b. Control components for terminal heating and cooling units not supplied with factory-wired controls.
 - c. Software and programming of BAS, GUI, development of all graphical screens, setup of schedules, logs and alarms, network management, global supervisory control applications, system integration and coordination and connection of the NAC to the local or wide area network.
 - d. BAS and Temperature Control wiring for a complete and operable system. All wiring shall be done in accordance with Division 26 of the specification and all local and national codes.
 - 2. Products furnished by ATC contractor for installation by the Mechanical contractor:
 - a. Control valves.
 - b. Control dampers.
 - c. Wells for hydronic temperature sensors.
 - d. Static and differential pressure sensors for piping systems.
 - 3. Products provided by Mechanical contractor:
 - a. Balancing dampers.
 - b. Smoke and smoke/fire dampers with actuators.
 - c. Temperature sensors for kitchen exhaust hood.
 - 4. Electrical contractor provides, in accordance with Division 26 and Division 28:
 - a. Providing motor starters and disconnect switches.
 - b. Power wiring and conduit.
 - c. Provision, installation and wiring of smoke detectors.

1.07 JOB CONDITIONS

- A. Cooperation with Other Trades: Coordinate the Work of this section with that of other sections to insure that the Work will be carried out in an orderly fashion. It shall be this Contractor's responsibility to check the Contract Documents for possible conflicts between his Work and that of other crafts in equipment location, pipe, duct and conduit runs, electrical outlets and fixtures, air diffusers, and structural and architectural features.

1.08 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Correct defective Work within a two year period after Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

- A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
- B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
- C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
- D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 0913.
- E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.
- F. System points lists included in the Documents are intended to show the desired alarm, monitoring, and control points. Add any control points necessary and as required to accomplish the sequence of operations.
- G. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.
- H. Extend the existing DDC control system for HVAC to the new and remodeled areas.
 - 1. Extension shall be seamless on the user interface. The existing graphics shall be upgraded or rebuilt so that the user interface has a uniform appearance between the new controls and the existing controls.
 - 2. Upgrade the existing DDC control system for HVAC to the latest version supported by the existing equipment.

2.02 OPERATOR INTERFACE

- A. Provide building operator interface accessible through facility LAN and remotely.
 - 1. The building operator web interface shall be accessible via a web browser without requiring any "plug-ins" (i.e. JAVA Runtime Environment (JRE), Adobe Flash).
- B. Provide a user interface with time-of-day schedules, data collection, dashboards, reports and building summary, system applications, and self-expiring timed overrides.

- C. Provide a published user and applications guide(s) that detail the system application operation, configuration, setup and troubleshooting.
- D. User Roles:
 - 1. The system shall include pre-defined “roles” that allow a system administrator to quickly assign permissions to a user.
 - 2. User logon/logoff attempts shall be recorded.
- E. Online Help and Training
 - 1. Provide a context sensitive, on line help system to assist the operator in operation and configuration of the system.
 - 2. On-line help shall be available for all system functions and shall provide the relevant data for each particular screen.
- F. System Graphics. Building operator web interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system.
 - 1. Animation: Graphics shall be able to animate by displaying different Image lies for changed object status.
 - 2. Alarm Indication: Indicate areas or equipment in an alarm condition using color or other visual indicator.
- G. Manual Control and Override.
 - 1. Point Control. Provide a method for a user to view, override, and edit if applicable, the status of any object and property in the system.
 - 2. Temporary Overrides. The user shall be able to perform a temporary override wherever an override is allowed, automatically removing the override after a specified period of time.
 - 3. Override Owners. The system shall convey to the user the owner of each override for all priorities that an override exists.
 - 4. Provide a specific icon to show timed override or operator override, when a point, unit controller or application has been overridden manually.
- H. Trend Logs:
 - 1. Prepare trend logs for all points required to show system calibration and stability.
 - 2. These logs shall document building operation after the installation, balancing and calibration is completed and after the control system is fully operational.
- I. Scheduling: The scheduling application shall provide graphical representation of the day, week, month and exception events.
 - 1. Occupied Period: Period of time when building is in use and occupied. Coordinate with owner for normal occupied hours and days. Generally systems will be fully operational throughout this period and ventilation air shall be continuously introduced. Space temperature setpoints will generally be in the “normal” range of 69°-77°F.
 - 2. Unoccupied period: period of time when the building or zone is not in use and unoccupied. Ventilation air shall not be introduced.
 - 3. Setback Period: Setback will typically start with the end of the occupied period and end with the start of the preoccupancy period, however it shall be provided with its own schedule. Generally systems will be off except to maintain a “setback” temperature, economization may be enabled to maintain “setback” cooling setpoint when applicable.
 - 4. Warm-up Period: Time prior to the Occupied period when the systems are returning the space temperatures from setback to “normal” or occupied setpoints (warm-up and cool-down).

Ventilation air shall not be introduced unless outside air conditions permit free-cooling. Time period shall be determined by an optimum start strategy unless otherwise specified.

J. Alarm/Event Notification

1. Alarm/Event Log. The operator shall be able to view all logged system alarms/events from any building operator web interface.
2. The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in a minimum of 4 categories based on severity.
3. The operator shall be able to acknowledge and add comments to alarms
4. Alarm/event messages shall use full language, easily recognized descriptors.
5. Alerts: Include a paging feature with telephone/email alerts to selected personnel for critical alarms as defined by Owner.

K. Alarm Prioritization:

1. Level 1 Fault Alarm: Highest priority alarm. Unit shutdown until condition is gone and fault is manually cleared.
2. Level 2 Problem Alarm: Unit operation is modified to compensate and alarm automatically clears when the condition is gone.
3. Level 3 Warning Alarm: Lowest priority alarms. Alarm is indicated to alert operator of condition that needs attention.

L. Existing Graphics: On projects where existing temperature control systems and graphics are being revised or added to the existing temperature control system, the following shall be provided:

1. Update existing graphics with updated floor plan including changes and additions associated with this project.
2. Graphics for existing equipment and floor plans shall be consistent with the format of the graphics for new equipment and floor plans.
3. Display all relocated and new control devices, controls setpoints, and monitoring points on the new graphics floor plan.

2.03 CONTROLLERS

A. Building Controllers:

1. General:
 - a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
 - b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
 - c. Share data between networked controllers.
 - d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
 - e. Utilize real-time clock for scheduling.
 - f. Continuously check processor status and memory circuits for abnormal operation.
 - g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
 - h. Communication with other network devices to be based on assigned protocol.
2. Communication:
 - a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.

- b. Perform routing when connected to a network of custom application and application specific controllers.
 - c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
- 3. Anticipated Environmental Ambient Conditions:
 - a. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at -40 to 150 degrees F.
 - b. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F.
- 4. Provisions for Serviceability:
 - a. Diagnostic LEDs for power, communication, and processor.
 - b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
- 5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
- 6. Power and Noise Immunity:
 - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.
- B. Custom Application Controller:
 - 1. General:
 - a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
 - b. Share data between networked, microprocessor based controllers.
 - c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
 - d. Utilize real-time clock for scheduling.
 - e. Continuously check processor status and memory circuits for abnormal operation.
 - f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
 - g. Communication with other network devices to be based on assigned protocol.
 - 2. Communication:
 - a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
 - b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
 - 3. Anticipated Environmental Ambient Conditions:
 - a. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at -40 to 150 degrees F.
 - b. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:
 - a. Diagnostic LED's for power, communication, and processor.
 - b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
 5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
 6. Power and Noise Immunity:
 - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.
- C. Application Specific Controllers:
1. General:
 - a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
 - b. Customized for operation within the confines of equipment served.
 - c. Communication with other network devices to be based on assigned protocol.
 2. Communication:
 - a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
 - b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
 3. Anticipated Environmental Ambient Conditions:
 - a. Outdoors and/or in Wet Ambient Conditions:
 - 1) Mount within waterproof enclosures.
 - 2) Rated for operation at -40 to 150 degrees F.
 - b. Conditioned Space:
 - 1) Mount within dustproof enclosures.
 - 2) Rated for operation at 32 to 120 degrees F.
 4. Provisions for Serviceability:
 - a. Diagnostic LEDs for power, communication, and processor.
 - b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
 5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
 6. Power and Noise Immunity:
 - a. Maintain operation at 90 to 110 percent of nominal voltage rating.
 - b. Perform orderly shutdown below 80 percent of nominal voltage.
 - c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.
- D. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
 2. All Input/Output Points:
 - a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.

- b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
- 3. Binary Inputs:
 - a. Allow monitoring of On/Off signals from remote devices.
 - b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
 - c. Sense dry contact closure with power provided only by the controller.
- 4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
- 5. Analog Inputs:
 - a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
 - b. Compatible with and field configurable to commonly available sensing devices.
- 6. Binary Outputs:
 - a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
 - b. Outputs provided with three position (On/Off/Auto) override switches.
 - c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
- 7. Analog Outputs:
 - a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
 - b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
 - c. Drift to not exceed 0.4 percent of range per year.
- 8. Tri State Outputs:
 - a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.
 - b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:
 - c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.
- 9. System Object Capacity:
 - a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.
 - b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.04 POWER SUPPLIES AND LINE FILTERING

- A. Power Supplies:
 - 1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
 - 2. Limit connected loads to 80 percent of rated capacity.
 - 3. Match DC power supply to current output and voltage requirements.
 - 4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.

5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
 6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.
 7. Operational Ambient Conditions: 32 to 120 degrees F.
 8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
 9. Line voltage units UL recognized and CSA approved.
- B. Power Line Filtering:
1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
 2. Minimum surge protection attributes:
 - a. Dielectric strength of 1000 volts minimum.
 - b. Response time of 10 nanoseconds or less.
 - c. Transverse mode noise attenuation of 65 dB or greater.
 - d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

PART 3 EXECUTION

3.01 INSTALLERS

- A. Installer List:
1. Energy Tech Systems.
 2. Substitutions: Not permitted.

3.02 INSTALLATION

- A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
- B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 0993.

3.03 COORDINATION

- A. Test and Balance Contractor
1. Furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
 2. Provide training in the use of these tools. This training will be planned for a duration of 4 hours.
 3. Provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
 4. The tools used during the test and balance process shall be returned to the ATC contractor at the completion of the testing and balancing.

3.04 ELECTRICAL WIRING AND CONNECTIONS

- A. Install raceways, boxes, and cabinets according to Division 26.
- B. Install building wire and cable according to Division 26.
- C. Install signal and communication cable according to Division 27.
- D. All junction boxes, junction box covers and raceway systems except those embedded directly in earth or concrete, or surface metal raceway systems (wiremold), shall be externally identified by permanent bright blue paint suitable for the purpose, to easily distinguish from other communication or power raceway systems. Items shall be painted prior to installation. In addition to field painted conduit,

factory painted conduit as manufactured by Allied Tube & Conduit (Data Com Blue Steel EMT), acceptable.

- E. Provide conduit where cables are concealed in walls, in mechanical rooms, and in rooms without ceilings.
 - 1. All control wiring in exposed, accessible or in inaccessible areas in Nursing Home, Patient Care and Hospital facilities, and Dormitories with an occupancy of 16 people or greater shall be run in conduit.
- F. Bundle and harness exposed multiconductor instrument cable in place of single cables where several cables follow a common path.
- G. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
- H. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
- I. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- J. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- K. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- L. The Temperature Control Contractor shall provide any line voltage wiring required for local or central control panels. Power may be extended from the nearest receptacle circuit or spare circuit breaker in nearest normal power panel.
- M. The Division 26 Contractor shall furnish all power wiring to electrical starters and motors.

3.05 CLEANING

- A. At the completion of work in any area, the installation contractor shall clean all of their work, equipment, etc., making it free from dust, dirt and debris.
- B. At the completion of work, all equipment furnished under this Section shall be checked for paint damage. Any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.
- C. Remove all protective labels and coverings from room sensors.

3.06 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate complete and operating system to Owner.
 - 1. Upon project completion provide oral operating and maintenance instruction to the owner's representative for a minimum of 8 hours during normal working hours. The contractor shall assist the owner in videotaping the instruction if they choose to do so.
 - 2. Provide a brief description of the controls' sequence of operation.
 - 3. Provide a discussion and explanation of all alarms, switches and gauges.
 - 4. Provide a summary and explanation of steps to be taken in response to specific alarms or control malfunctions.
 - 5. Perform a building walk-through to physically locate and examine all control devices and demonstrate control setpoint adjustment procedures.
 - 6. Provide instructions regarding adjustment procedures shall emphasize methods for continual building "fine-tuning"

- B. Demonstrate complete and proper operation of all systems per the Sequence of Operations to Engineer. The demonstration shall include, but not necessarily be limited to, the following:
 - 1. Review of the trend logs.
 - 2. Complete and proper operation of control systems including setpoints, valve positions, etc. shall be adjusted to artificially induce the sequences to occur.
 - 3. Access to all devices for required maintenance.
 - 4. Review of associated graphics on Host.
 - 5. Identify and configure alarms.
- C. Provide written operating and maintenance instruction including a copy of each of the above-mentioned submittals, inspection and calibration frequency and cleaning methods with recommended cleaning materials. Provide 2 copies to the Engineer in 3-ring binders.
- D. Satisfactory completion is when all required training and testing to show performance compliance with the requirements of the Contract Documents has been performed to the satisfaction of the Engineer. System acceptance shall be contingent upon completion and review of all corrected deficiencies.

3.07 MAINTENANCE

- A. Provide service and maintenance of energy management and control systems for one years from Date of Substantial Completion.
- B. Provide two complete inspections, one in each season, to inspect, calibrate, and adjust controls as required, and submit written reports.

END OF SECTION

SECTION 23 0993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.

1.02 RELATED REQUIREMENTS

- A. Section 23 0913 - Instrumentation and Control Devices for HVAC.
- B. Section 23 0923 - Direct-Digital Control System for HVAC.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. State each sequence in small segments and give each segment a unique number for referencing in Functional Test procedures; provide a complete description regardless of the completeness and clarity of the sequences specified in Contract Documents.
 - 2. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
 - 3. For packaged controlled equipment, include manufacturer's furnished sequence of operation amplified as required to describe the relationship between the packaged controls and the control system, indicating which points are adjustable control points and which points are only monitored.
- C. Control System Diagrams: Submit graphic schematic of the control system showing each control component and each component controlled, monitored, or enabled.
- D. Points List: Submit list of all control points indicating at least the following for each point.
 - 1. Name of controlled system.
 - 2. Point abbreviation.
 - 3. Point description; such as dry bulb temperature, airflow, etc.
 - 4. Display unit.
- E. Project Record Documents: Record actual locations of components and setpoints of controls, including changes to sequences made after submission of shop drawings.

1.04 ALARM NOMENCLATURE

- A. Level 1 Fault Alarm: Highest priority alarm. Unit shutdown until condition is gone and fault is manually cleared.
- B. Level 2 Problem Alarm: Unit operation is modified to compensate and alarm automatically clears when the condition is gone.
- C. Level 3 Warning Alarm: Lowest priority alarms. Alarm is indicated to alert operator of condition that needs attention.
- D. Binary Alarm: General alarm when alarm signal is received from equipment controller.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ROOFTOP UNIT

- A. RTU-2: variable volume geothermal RTU heat pump with supply fan, exhaust fan, air coil, compressor, filters, and economizer.
 - 1. Duct static pressure setpoint reset: Adjust at a frequency of once every 5 minutes.
 - a. Set maximum duct static based on Drawings schedule.
 - b. Decrease duct static pressure setpoint so that the VAV damper with the greatest demand is not less than 80% open.
 - c. Increase duct static pressure setpoint if any VAV damper is at 100% open.
 - 2. Supply air temperature setpoint reset:
 - a. Normal operation during occupied hours: Set to 55 degrees F.
 - b. Linearly increase setpoint as return air temperature drops below 75 degrees F.
 - 3. Supply fan:
 - a. Run fan continuously during occupied hours. Cycle on call for heating during unoccupied hours.
 - b. Modulate fan to maintain duct static pressure setpoint.
 - c. Shut off fan on high static pressure alarm.
 - 4. Exhaust fan:
 - a. Run fan when supply fan is running.
 - b. Modulate fan speed to maintain building pressure.
 - 5. Control valve: Open on call for heating or cooling.
 - a. Valve must be open before compressor runs.
 - 6. Compressor: Cycle to maintain zone temperature setpoint.
 - 7. Reversing valve: Cycle as required to provide heating or cooling.
 - 8. Economizer:
 - a. Unoccupied hours: Set return damper to 100% open and outside air damper to 0% open.
 - b. Occupied hours: Open outside air damper to minimum position set by test and balance for ventilation.
 - c. Economizer mode: When outside air is below 55 degrees F, modulate return and outside air dampers to deliver 55 degree F supply air.
 - 1) Lock out mechanical cooling during economizer mode.
 - d. Freeze Protection: If freezing temperatures are detected, close outside air damper and full open return air damper.
 - 9. Filters: Measure differential pressure over filters and alarm on pressure increase.
- B. Display: For each air handler:
 - 1. Actual temperatures for supply air, return air, exhaust air, outside air, mixed air.
 - 2. Setpoint temperatures for supply air.
 - 3. Duct pressure setpoint and actual.
 - 4. Occupied status.
 - 5. Supply fan status and speed.
 - 6. Exhaust fan status and speed.
 - 7. Heating/Cooling status.
 - 8. Control-valve position.

9. Filters Normal/Dirty status.
10. Critical zone VAV for pressure zone optimization.
11. Alarms.
 - a. Binary: VFD fault.
 - b. Binary: Heat pump factory alarm status.
 - c. Level 1: High static pressure trip.
 - d. Level 2: Freezestat trip.
 - e. Level 2: Supply fan fail.
 - f. Level 2: Exhaust fan fail.
 - g. Level 2: Supply air temperature 10 degree F from setpoint.
 - h. Level 3: Supply or return fan in Hand operation.
 - i. Level 3: Dirty filters.
12. BAS system graphic.

3.02 AIR TERMINAL UNITS (VAV'S)

- A. Single-duct, Variable Volume:
 1. Cooling Only:
 - a. On a rise in space temperature, the damper will modulate to provide maximum airflow.
 - b. As space temperature decreases, the damper will modulate down to its minimum airflow.
 2. Cooling with Reheat:
 - a. On a rise in space temperature above the cooling set-point, the unit modulates to its maximum airflow.
 - b. As the space temperature falls below the cooling set-point, the unit modulates to its minimum airflow.
 - c. As the space temperature continues to fall to the heating set-point, the terminal modulates to its heating minimum airflow. At this point, the heat will be staged on as follows:
 - 1) Heating valve shall open to meet heating discharge air setpoint.
 - 2) Unit shall modulate to its heating maximum airflow while maintaining heating discharge air setpoint.
- B. Display:
 1. Zone temperature: actual and set point.
 2. Discharge air temperature: actual and set point.
 3. Airflow: actual and setpoint.
 4. Occupied status.
 5. Control-valve positions as percent open.
 6. Damper positions as percent open.
 7. Alarms.
 - a. Level 2: Zone temperature 5°F outside of setpoint.
 8. BAS system graphic.

3.03 CABINET HEATERS

- A. Hydronic heat:
 1. Cycle fan and open control valve to maintain zone temperature.
 2. Cycle fan to maintain zone temperature.
 3. Unit control by others. Open control valve when outside air temperature is below 45 degrees F.
- B. Display:

1. Outside air temperature.
2. Zone temp: actual and set point.
3. Control valve position.
4. Fan operation status.
5. Alarms.
 - a. Level 2: Zone temperature 5 degrees F from setpoint.
6. BAS system graphic.

3.04 FANS

- A. Toilet room exhaust: Control by others.

3.05 HEATING COILS

- A. Hydronic reheat coils: Modulate control valve to maintain heating discharge air temperature setpoint.
- B. Display:
 1. Discharge air temperature: actual and set point.
 2. Control-valve positions as percent open.
 3. Alarms:
 - a. Level 2: Discharge temperature 10°F below setpoint.
 4. BAS system graphic.

3.06 SEWAGE PUMP

- A. Description: Sump pump with factory controls, SP-1
- B. Monitor sump pump controller high water alarm.
- C. Display:
 1. Alarms:
 - a. Level 2: High water alarm.
 2. BAS system graphic.

END OF SECTION

SECTION 23 2113 - HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water and glycol piping, above grade.
- C. Geothermal water piping, above grade.
- D. Equipment drains and overflows.
- E. Pipe hangers and supports.
- F. Unions, flanges, mechanical couplings, and dielectric connections.
- G. Valves:
 - 1. Ball valves.
 - 2. Butterfly valves.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.
- C. Section 23 0719 - HVAC Piping Insulation.
- D. Section 23 2500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- E. ASME B31.9 - Building Services Piping; 2020.
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2024.
- H. ASTM B32 - Standard Specification for Solder Metal; 2020.
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- K. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
- L. ASTM D2241 - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2025.
- M. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2024.
- N. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2020.
- O. ASTM D2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping; 2021a.

- P. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).
- Q. ASTM F1960 - Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-Linked Polyethylene (PEX) and Polyethylene of Raised Temperature (PE-RT) Tubing; 2024.
- R. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.
- S. ASTM F2389 - Standard Specification for Pressure-Rated Polypropylene (PP) Piping Systems; 2023.
- T. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- U. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).
- V. AWWA C606 - Grooved and Shouldered Joints; 2022.
- W. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.
- C. Project Record Documents: Record actual locations of valves.
- D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

- A. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
 - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
 - 3. Grooved mechanical joints may be used in accessible locations only.
 - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Engineer.
 - b. Use rigid joints unless otherwise indicated.
 - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
 - 1. For throttling, bypass, or manual flow control services, use ball or butterfly valves.
 - 2. For shut-off and to isolate parts of systems or vertical risers, use ball or butterfly valves.

2.02 HEATING WATER AND GLYCOL PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
 - 1. Welded Joints: Sizes 2-1/2 inches and larger; ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: Sizes 2 inches and smaller; ASME B16.3, malleable iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn, using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
 - 2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
 - 3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
 - 4. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.
- C. Pressure-Rated Polypropylene Pipe: ASTM D2774 or ASTM F2389, PP-RCT resin pipe with fiber layer, SDR 11 or SDR 9.
 - 1. Fittings: ASTM F2389, butt, socket, or saddle-weld heat fusion. Transitions to comply with ASTM F1960 or ASME B16.5.
 - 2. Manufacturers:
 - a. Uponor, Inc: www.uponorpro.com/#sle.
 - b. Aquatherm.
 - c. Substitutions: See Section 23 0500 - HVAC General Provisions.

2.03 GEOTHERMAL WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
 - 1. Welded Joints: Sizes 2-1/2 inches and larger; ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: Sizes 2 inches and smaller; ASME B16.3, malleable iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
 - 2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
 - 3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.
 - 4. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

- C. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
 - 1. Fittings: ASTM D2466 or ASTM D2467, PVC.
 - 2. Joints: Solvent welded in accordance with ASTM D2855.
- D. Pressure-Rated Polypropylene Pipe: ASTM D2774 or ASTM F2389, PP-RCT resin pipe with fiber layer, SDR 17.6 or SDR 11.
 - 1. Fittings: ASTM F2389, butt, socket, or saddle-weld heat fusion. Transitions to comply with ASTM F1960 or ASME B16.5.
 - 2. Manufacturers:
 - a. Uponor, Inc; _____: www.uponorpro.com/#sle.
 - b. Aquatherm.
 - c. Substitutions: See Section 23 0500 - HVAC General Provisions.

2.04 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
- B. PVC Pipe: ASTM D1785, Schedule 40, or ASTM D2241, SDR 21 or 26.
 - 1. Fittings: ASTM D2466 or D2467, PVC.
 - 2. Joints: Solvent welded in accordance with ASTM D2855.

2.05 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
 - 3. Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.
 - 4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
 - 5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - 6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Greater: Steel channels with welded spacers and hanger rods, cast iron roll.
 - 7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
 - 8. Wall Support for Pipe Sizes 4 Inches and Greater: Welded steel bracket and wrought steel clamp.
 - 9. Vertical Support: Steel riser clamp.
 - 10. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
 - 11. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
 - 12. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.
- B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.06 BALL VALVES

- A. Manufacturers:
 - 1. Anvil International: www.anvilintl.com/#sle.
 - 2. Apollo Valves: www.apollovalves.com/#sle.
 - 3. Grinnell Products: www.grinnell.com/#sle.
 - 4. Victaulic Company: www.victaulic.com/#sle.

5. Milwaukee Valve Company.
 6. Nexus Valve.
 7. NIBCO INC.
 8. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 9. Viega, LLC.
 10. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Up To and Including 2 Inches:
1. Bronze one piece body, chrome plated brass ball, teflon seats and stuffing box ring, lever handle with balancing stops, solder ends with union.

2.07 BUTTERFLY VALVES

- A. Manufacturers:
1. Anvil International: www.anvilintl.com/#sle.
 2. Apollo Valves: www.apollovalves.com/#sle.
 3. Grinnell Products: www.grinnell.com/#sle.
 4. Victaulic Company: www.victaulic.com/#sle.
 5. Milwaukee Valve Company.
 6. Nexus Valve.
 7. NIBCO INC.
 8. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 9. Viega, LLC.
 10. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Body: Cast or ductile iron with resilient replaceable EPDM seat, wafer, lug, or grooved ends, extended neck.
- C. Disc: Construct of aluminum bronze, chrome plated ductile iron, stainless steel, ductile iron with EPDM encapsulation, or Buna-N encapsulation.
- D. Operator: 10 position lever handle.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment using jointing system specified.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. See Section 23 2500 for additional requirements.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interference with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls, and floors.
- G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 23 0516.
 - 1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.
 - 2. Use flexible couplings in expansion loops.
- I. Grooved Joints:
 - 1. Install in accordance with the manufacturer's latest published installation instructions.
 - 2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.
- J. Pipe Hangers and Supports:
 - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
 - 2. Place hangers within 12 inches of each horizontal elbow.
 - 3. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 4. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - 5. Provide copper plated hangers and supports for copper piping.
- K. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 23 0719.

3.03 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1. 1 Inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 2. 1-1/2 Inches and 2 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 3. 2-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 - 4. 3 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- B. Hanger Spacing for Steel Piping.
 - 1. 1/2 Inch, 3/4 Inch, and 1 Inch: Maximum span, 7 feet; minimum rod size, 1/4 inch.
 - 2. 1-1/4 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 3. 1-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 - 4. 2 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.
 - 5. 2-1/2 Inches: Maximum span, 11 feet; minimum rod size, 3/8 inch.
 - 6. 3 Inches: Maximum span, 12 feet; minimum rod size, 3/8 inch.
 - 7. 4 Inches: Maximum span, 14 feet; minimum rod size, 1/2 inch.
- C. Hanger Spacing for Plastic Piping.
 - 1. 1/2 Inch: Maximum span, 42 inches; minimum rod size, 1/4 inch.
 - 2. 3/4 Inch: Maximum span, 45 inches; minimum rod size, 1/4 inch.
 - 3. 1 Inch: Maximum span, 51 inches; minimum rod size, 1/4 inch.
 - 4. 1-1/4 Inches: Maximum span, 57 inches; minimum rod size, 3/8 inch.
 - 5. 1-1/2 Inches: Maximum span, 63 inches; minimum rod size, 3/8 inch.
 - 6. 2 Inches: Maximum span, 69 inches; minimum rod size, 3/8 inch.
 - 7. 3 Inches: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 8. 4 Inches: Maximum span, 8 feet; minimum rod size, 1/2 inch.

END OF SECTION

SECTION 23 2114 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air vents.
- B. Strainers.
- C. Balancing valves.
- D. Glycol system.

1.02 SUBMITTALS

- A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.
- B. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- C. Project Record Documents: Record actual locations of flow controls.
- D. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 AIR VENTS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 - 2. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
 - 3. Nexus Valve, Inc: www.nexusvalve.com/#sle.
 - 4. Taco, Inc: www.taco-hvac.com/#sle.
 - 5. Armstrong Pumps, Inc.
 - 6. Wessels Company.
 - 7. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Manual Air Vent: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- C. Maximum Fluid Pressure: 150 psi.

2.02 STRAINERS

- A. Manufacturers:
 - 1. American Wheatley, a company of Global Flow Products, LLC: www.wheatleyhvac.com/#sle.
 - 2. Armstrong International, Inc: www.armstronginternational.com/#sle.
 - 3. Grinnell Products: www.grinnell.com/#sle.
 - 4. Nexus Valve, Inc: www.nexusvalve.com/#sle.

5. The Metraflex Company: www.metroflex.com/#sle.
 6. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
 7. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Size 2 inch and Under:
1. Provide threaded, grooved, or sweat brass or iron body for up to 175 psi working pressure, Y-pattern strainer with 1/32 inch stainless steel perforated screen.
 2. Body Material by Fluid Service:
 - a. Cast Iron or Brass:
 - 1) Liquids: Up to 400 psi at 150 degrees F.

2.03 BALANCING VALVES

- A. Manufacturers:
1. Bell & Gossett, a brand of Xylem, Inc: www.bellgossett.com/#sle.
 2. Hays Fluid Controls: www.haysfluidcontrols.com/#sle.
 3. Nexus Valve, Inc: www.nexusvalve.com/#sle.
 4. Gerand Engineering Co.
 5. Tour & Andersson.
 6. Viega, LLC.
 7. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Size 2 inch and Smaller:
1. Provide ball or globe style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and female sweat, NPT threaded, press, or soldered connections.
 2. Metal construction materials consist of bronze or brass.
 3. Non-metal construction materials consist of Teflon, EPDM, or engineered resin.
- C. Size 2-1/2 inch and Larger:
1. Provide ball, globe, or butterfly style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and flanged, grooved, or weld-end connections.
 2. Valve body construction materials consist of cast iron, carbon steel, or ductile iron.
 3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, or engineered resin.
- D. Accessories: Provide hanging tag.

2.04 GLYCOL SYSTEM

- A. Glycol Solution:
1. Manufacturers:
 - a. Dow Chemical.
 - b. Houghton Chemical Corporation.
 - c. JeffCool Products.
 - d. Rhomar Water Products.
 2. Water-based solution mix containing 30% propylene glycol.
 - a. Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives.
 3. Water quality requirements:
 - a. Maximum Concentrations: Chlorides, 25 ppm; Sulfates, 25 ppm; Calcium, 50 ppm; Magnesium, 50 ppm.
 - b. Total Hardness: Less than 100 ppm.
 - c. Provide water test results to engineer prior to filling system.

- d. If any of the above categories are exceeded, the Contractor shall use a factory premixed water/glycol solution or obtain distilled or deionized water to dilute the glycol to the strength specified.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Provide manual air vents at system high points and as indicated.

3.02 WATER FLOW CONTROL DEVICES

- A. Provide on return connection for all hydronic heat transfer devices with scheduled flows.
- B. Furnish with chained metal tag showing location, size, GPM, and meter reading.

3.03 GLYCOL SYSTEM

- A. Feed glycol solution to system through make-up line with pressure regulator, venting system high points.
- B. After glycol solution is circulated for a minimum of 10 hours, perform tests determining strength of glycol and water solution and submit written test results.
- C. Install glycol make-up unit as shown on Drawings, located next to main system expansion tank. Connect into piping to expansion tank. Provide application specific pressure reducing valve between GMU and connection to the system piping. Pipe according to manufacturer recommendation.
- D. Attach tag near the system fill connection indicating manufacturer name, brand name/number and protection level (°F) of the Glycol water solution.

3.04 MAINTENANCE

- A. Perform monthly visit to make glycol fluid concentration analysis on site with refractive index measurement instrument. Report findings in detail in writing, including analysis and amounts of glycol or water added.
- B. Explain corrective actions to Owner's maintenance personnel in person.

END OF SECTION

SECTION 23 3100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ducts.
- B. Flexible ducts.

1.02 RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 0130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.
- C. Section 23 0713 - Duct Insulation: External insulation and duct liner.
- D. Section 23 3319 - Duct Silencers.

1.03 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- 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 E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- D. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).
- E. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).
- F. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- G. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- J. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. Product Data: Provide data for duct materials.
- B. Shop Drawings: Indicate duct fitting types, gauges, sizes, welds, and configuration.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated.
- C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 23 3319.
- D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
 - 1. Round: Plus or minus 2 in-wc of galvanized steel.
 - 2. Rectangular: Plus or minus 1/2 in-wc of galvanized steel.

- E. Duct Sealing and Leakage in accordance with Static Pressure Class:
 - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
 - a. Supply Air: 1/2 in-wc pressure class, galvanized steel.
 - b. Return and Relief Air: 1/2 in-wc pressure class, galvanized steel.
 - c. General Exhaust Air: pressure class, galvanized steel.
- F. Duct Fabrication Requirements:
 - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
 - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 - 3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
 - 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
 - 5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - 6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
 - 7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

- A. Material Requirements:
 - 1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Round Spiral Duct:
 - 1. Round spiral lock seam duct with galvanized steel outer wall.
- C. Connectors, Fittings, Sealants, and Miscellaneous:
 - 1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
 - 2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
 - 3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - 4. Gasket Tape:
 - a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
 - 5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
 - 6. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:
 - a. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

- b. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
- c. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
- d. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
- e. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
- f. Other Types: As required.

2.03 FLEXIBLE DUCTS

- A. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form spiral helix.
 - 1. Insulation: R6 insulation with aluminized vapor barrier film.
 - 2. Pressure Rating: 10 in-wc positive and 5 in-wc negative.
 - 3. Maximum Velocity: 5500 fpm.
 - 4. Temperature Range: Minus 20 degrees F to 250 degrees F.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Flexible Ducts: Connect to metal ducts with draw bands.
- E. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- G. Connect terminal units to supply ducts directly or with 8 foot maximum length of flexible duct. Do not use flexible duct to change direction.
- H. Fire Partitions: Provide firestopping sealing. See Section 07 8400.
- I. Duct Insulation: Provide duct insulation. See Section 23 0713.
- J. Ductwork shall be run as high as possible in all rooms to maintain proper headroom. Where two or more ducts cross each other, they must be arranged in such a manner as to maintain the greatest possible clearance underneath.
- K. Ductwork shall not cover any electrical outlets or junction boxes. Consult with other trades to avoid interference with piping runs, etc.
- L. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- M. Ducts shall conform to dimensions on the Drawings unless location of structural members prohibit. Make minor changes in run of certain ducts without extra cost to the Owner if necessary to avoid unforeseen structural or other interferences.
- N. All ducts shall be straight and smooth on the inside with finished joints. No inside standing seams will be permitted in ductwork. No single thickness partitions shall be allowed between ducts. The Engineer reserves the right to order any open seams or joints made tight by caulking or taping. No open joints at corners or elsewhere will be allowed.
- O. Where space permits, elbows shall have a centerline radius equal to 1½ times their width. Shorter radius and square throat elbows shall be used where required to fit restricted areas only and where

required by the duct connection details on the Drawings. All short radius and square throat elbows shall be provided with turning vanes.

3.02 CLEANING

- A. Clean thoroughly each duct system. See Section 23 0130.51.

END OF SECTION

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Duct access doors.
- B. Duct test holes.
- C. Flexible duct connectors.
- D. Miscellaneous Products:

1.02 RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- B. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- D. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- C. Project Record Drawings: Record actual locations of access doors and test holes.

1.05 QUALITY ASSURANCE

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUAL VOLUME DAMPERS

- A. Manufacturers:
 - 1. Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com/#sle.
 - 2. Nailor Industries, Inc: www.nailor.com/#sle.
 - 3. Ruskin Company: www.ruskin.com/#sle.
 - 4. Greenheck Fan Corporation.
 - 5. Pottorff: www.pottorff.com/#sle.
 - 6. Vent Products Company, Inc.
 - 7. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Standard, Galvanized Steel, Manual Volume Dampers:
 - 1. Suitable for horizontal or vertical applications.
 - 2. Single blade, or multiple, opposed-blade design.
- C. Adjustable quadrants or regulators: Plainly marked to indicate position of damper, with locking nut.

2.02 DUCT ACCESS DOORS

- A. Manufacturers:

1. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
 2. Nailor Industries, Inc: www.nailor.com/#sle.
 3. Ruskin Company: www.ruskin.com/#sle.
 4. Greenheck Fan Corporation.
 5. MIFAB.
 6. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.
1. Less Than 12 inches Square: Secure with sash locks.
 2. Up to 18 inches Square: Provide two hinges and two sash locks.
 3. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
 4. Larger Sizes: Provide an additional hinge.
 5. High Temperature Duct Access Doors:
 - a. Comply with NFPA 96.
 - b. Comply with UL 1978.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.03 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

2.04 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
1. Carlisle HVAC Products: www.carlislehvac.com/#sle.
 2. Ductmate Industries, Inc, a DMI Company: www.ductmate.com/#sle.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
 4. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections: Fabric crimped into metal edging strip.
1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
 - a. Net Fabric Width: Approximately 6 inches wide.
 2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.
- D. Maximum Installed Length: 14 inch.

2.05 MISCELLANEOUS PRODUCTS

- A. Residential Dryer Exhaust Receptacle: Formed aluminized-steel in-wall receptacle to house flexible transition duct; seamless interior, rounded corners; integral nailing flanges. Match depth of box to depth of stud cavity.

PART 3 EXECUTION

3.01 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

3.02 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 3100 for duct construction and pressure class.
- B. Provide duct access doors for inspection, adjusting, and cleaning at the following locations and elsewhere as indicated:
 - 1. Upstream of duct coils.
 - 2. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links.
 - 3. Provide minimum 12" by 12" size access door for hand and shoulder access, or as indicated on drawings.
 - 4. Label access doors to indicate purpose of access.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- E. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- F. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

3.03 FIELD QUALITY CONTROL

- A. Operate dampers to verify full range of movement.
- B. Inspect locations of access doors and verify that purpose of access door can be performed.
- C. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.

END OF SECTION

SECTION 23 3423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Cabinet exhaust fans.

1.02 REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2016.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016, with Errata (2018).
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate fan roof curbs and service utilities installation according to fan size.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on fans and accessories, including fan curves with specified operating point plotted, power, rpm, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

PART 2 PRODUCTS

2.01 POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: Comply with AMCA 204.
- B. Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C. Sound Ratings: Comply with AMCA 301, tested to AMCA 300, bearing certified sound ratings seal.
- D. Fabrication: Comply with AMCA 99.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.02 CABINET EXHAUST FANS

- A. Manufacturers:
 - 1. Broan-NuTone, LLC; 744 Recessed Ventilation Fan with Light: www.broan-nutone.com/#sle.
 - 2. Carnes, a division of Carnes Company Inc; _____: www.carnes.com/#sle.
 - 3. Greenheck Fan Corporation; _____: www.greenheck.com/#sle.
 - 4. PennBarry, Division of Air System Components; _____: www.pennbarry.com/#sle.
 - 5. Twin City Fan & Blower; T: www.tcf.com/#sle.
 - 6. Substitutions: See Section 23 0500 - HVAC General Provisions.

- B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resiliently mounted motor, gravity backdraft damper in discharge.
- C. Disconnect Switch: Cord and plug-in housing for thermal overload protected motor and wall mounted switch.
- D. Grille: Molded white plastic.
- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is reached with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Hung Cabinet Fans:
- C. Provide backdraft dampers on outlet from cabinet and ceiling exhausters fans and as indicated.

END OF SECTION

SECTION 23 3600 - AIR TERMINAL UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single-duct terminal units.
 - 1. Variable-volume units.
- B. Hose kits and valves.

1.02 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- B. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).
- B. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017.
- C. ASTM A492 - Standard Specification for Stainless Steel Rope Wire; 1995 (Reapproved 2019).
- D. ASTM A603 - Standard Specification for Metallic-Coated Steel Structural Wire Rope; 2019.
- E. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.
- F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- G. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.
- H. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings that indicate airflow, static pressure, and NC designation. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate configuration, general assembly, and materials used in fabrication, and electrical characteristics and connection requirements.
- D. Project Record Documents: Record actual locations of units and locations of access doors required for access of valving.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists. Include directions for resetting constant-volume regulators.
- F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 SINGLE-DUCT, VARIABLE-VOLUME UNITS

- A. Manufacturers:

1. Krueger-HVAC: www.krueger-hvac.com/#sle.
2. Metalaire, a brand of Metal Industries Inc: www.metalaire.com/#sle.
3. Price Industries, Inc: www.priceindustries.com/#sle.
4. Trane, a brand of Ingersoll Rand: www.trane.com/#sle.
5. Tuttle and Bailey: www.tuttleandbailey.com/#sle.
6. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.
7. Carnes, a division of Carnes Company Inc: www.carnes.com/#sle.
8. Nailor Industries Inc: www.nailor.com/#sle.
9. Substitutions: See Section 23 0500 - HVAC General Provisions.

B. General:

1. Factory-assembled, AHRI 880 (I-P) rated and bearing the AHRI seal, air volume control terminal with damper assembly, flow sensor, externally mounted volume controller, duct collars, and all required features.
2. Control box bearing identification, including but not necessarily limited to nominal cfm, maximum and minimum factory-set airflow limits, coil type and coil (right or left hand) connection, where applicable.

C. Unit Casing:

1. Minimum 22 gauge, 0.0299 inch galvanized steel.
2. Air Inlet Collar: Provide round, suitable for standard flexible duct sizes.
3. Unit Discharge: Rectangular, with slip-and-drive connections.
4. Acceptable Liners:
 - a. 1/2 inch thick, coated, fibrous-glass complying with ASTM C1071.
 - 1) Secure with adhesive.
 - 2) Coat edges exposed to airstream with NFPA 90A approved sealant.
 - 3) Cover liner with non-porous foil.
 - b. Liner not to contain pentabrominated diphenyl ether (CAS #32534-81-9) or octabrominated diphenyl ether.

D. Damper Assembly:

1. Heavy-gauge, galvanized steel, or extruded aluminum construction with solid steel, nickel-plated shaft pivoting on HDPE, self-lubricating bearings.
2. Provide integral position indicator or alternative method for indicating damper position over full range of 90 degrees.
3. Incorporate low leak damper blades for tight airflow shutoff.

E. Hot Water Heating Coil:

1. Coil Casing: Minimum 22 gauge, 0.0299 inch galvanized steel, factory-installed on terminal discharge with rectangular outlet, duct connection type.
2. Coil Fins: Aluminum or aluminum plated fins, mechanically-bonded to seamless copper tubes.
3. Coil leak tested to minimum 350 psig.
4. Base performance data on tests run in accordance with AHRI 410 and units to bear AHRI 410 label.

F. Controls:

1. By ATC.

2.02 HOSE KITS AND VALVES

A. Manufacturers:

1. Griswold Controls: www.griswoldcontrols.com/#sle.

2. Hays Fluid Controls: www.haysfluidcontrols.com/#sle.
 3. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Hoses:
1. Provide hoses for all units for connection to main water supply and return headers.
 2. Length: 2 feet.
 3. Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.
- C. Ball Valves:
1. Brass body for shutoff and hydronic balancing.
 2. Provide pressure/temperature ports.
 3. Provide balancing valves.
- D. Y Strainers:
1. Bronze body.
 2. "Y" type configuration with brass cap.
 3. Maximum Operating Pressure: Minimum 450 psi.
 4. Screen: Stainless steel.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the inlets of air terminal units and air flow sensors a minimum of four duct diameters from elbows, transitions, and duct takeoffs.
- C. Provide ceiling access doors or locate units above easily removable ceiling components.
- D. Support units individually from structure with wire rope complying with ASTM A492 and ASTM A603 in accordance with SMACNA (SRM). See Section 23 0548.
- E. Do not support from ductwork.
- F. Connect to ductwork in accordance with Section 23 3100.
- G. Install piping adjacent to air terminal unit to allow service and maintenance.
- H. Hot-Water Piping: Connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.
- I. Maintain required electrical clearances in front of control boxes.

3.02 CLEANING

- A. Vacuum clean coils and inside of units.

END OF SECTION

SECTION 23 3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers:
- B. Rectangular ceiling diffusers.
- C. Slot ceiling diffusers.
- D. Registers/grilles:
 - 1. Ceiling-mounted, egg crate exhaust and return register/grilles.
- E. Goosenecks.

1.02 REFERENCE STANDARDS

- A. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carnes, a division of Carnes Company Inc: www.carnes.com/#sle.
- B. Krueger-HVAC: www.krueger-hvac.com/#sle.
- C. Price Industries: www.price-hvac.com/#sle.
- D. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.
- E. Tuttle and Bailey: www.tuttleandbailey.com/#sle.
- F. Nailor Industries Inc: www.nailor.com/#sle.
- G. Hart & Cooley, Inc.
- H. Shoemaker.
- I. Substitutions: See Section 23 0500 - HVAC General Provisions.

2.02 RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide square formed adjustable, backpan stamped, and core removable ceiling diffusers constructed to maintain 360 degree discharge air pattern with sectorizing baffles where indicated.
- B. Connections: Round.
- C. Frame: Provide surface mount and inverted T-bar type as scheduled. In plaster ceilings, provide plaster frame and ceiling frame.
- D. Fabrication: Steel with baked enamel finish.
- E. Color: As indicated on drawings.
- F. Accessories: As indicated on drawings.

2.03 CEILING SLOT DIFFUSERS

- A. Type: Continuous slot, with adjustable vanes for left, right, or vertical discharge.
- B. Fabrication: Aluminum extrusions with factory baked enamel finish.
- C. Color: As indicated on the drawings.
- D. Plenum: Integral, galvanized steel, insulated.
 - 1. Provide sloped shoulder for 10 foot ceilings or lower.
 - 2. Provide square shoulder for ceilings higher than 10 feet.
- E. Accessories: As indicated on the Drawings and as follows.
 - 1. Mitered Corners: where required
 - 2. Blank off: where required
 - 3. Alignment strips: where multiple sections are to be assembled to appear as one continuous diffuser.
 - 4. Plaster Frame Spacers: where installed in plaster frame
 - 5. Field Cut Diffusers: provide diffusers 6" longer than specified to allow the diffuser to be cut in the field. Field cutting shall be specified where a continuous run of diffusers is required.
 - 6. Equalizing Core: where installed on spiral ducts.

2.04 CEILING EGG CRATE EXHAUST AND RETURN GRILLE

- A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch grid core.
- B. Fabrication: Grid core consists of aluminum with mill aluminum finish.
- C. Color: As indicated on the drawings.
- D. Accessories: Provide integral gang and face operated opposed blade damper, as indicated on drawings.

2.05 GOOSENECKS

- A. Fabricate in accordance with of minimum 18 gauge, 0.0598 inch galvanized steel.
- B. Mount on minimum 12 inch high curb base where size exceeds 9 by 9 inch.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

3.02 CLOSEOUT ACTIVITIES

- A. Demonstrate operational system to Owner's representative.
- B. Instruct Owner's representative to maintain system and use occupant controls or interfaces, as required.

3.03 PROTECTION

- A. Protect installed products until completion of project.
- B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION

SECTION 23 7413 - PACKAGED OUTDOOR CENTRAL-STATION AIR-HANDLING

UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Packaged roof top unit.
- B. Unit controls.
- C. Remote panel.
- D. Roof mounting curb and base.

1.02 RELATED REQUIREMENTS

- A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

1.03 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- C. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- D. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.
- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Extra Filters: One set for each unit.

1.04 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Carrier Global Corporation: www.carrier.com/#sle.
- B. Trane Technologies, PLC: www.trane.com/#sle.
- C. York, a brand of Johnson Controls International, PLC: www.york.com/#sle.
- D. AAON.
- E. Substitutions: See Section 23 0500 - HVAC General Provisions.

1. Any manufacturer that submits a Prior Approval request must provide the following at minimum: selection drawings that indicate physical size, component characteristics (CFM/HP/weight/electrical characteristics), and letter indicating current ship date from time of bid for all components.
2. The installing Contractor is responsible to ensure that any substituted equipment is equivalent in fit, form and function to the scheduled and specified equipment.
3. The cost of any additional work caused by the substitution of equipment shall be borne by the Contractor.

2.02 FAULT CURRENT PROTECTION

- A. Mechanical equipment with electrical requirements of 20 amps or greater shall be marked from the manufacturer with the short-circuit current rating (SCCR) on the equipment nameplate. Minimum SCCR value shall be as listed below unless scheduled otherwise on Drawing schedules.
- B. Ratings for 208/3/60 systems:
 1. 20-amp current protection or less: 5,000 SCCR.
 2. 40-amp current protection or less: 10,000 SCCR.
 3. 150-amp current protection or less: 35,000 SCCR.
 4. Above 150-amp current protection: 65,000 SCCR.

2.03 MANUFACTURED UNITS

- A. General: Roof mounted units having geothermal based heating and cooling.
- B. Description: Self-contained, packaged, factory assembled and prewired, consisting of cabinet and frame, supply fan, exhaust fan, controls, air filters, refrigerant cooling coil and compressor, geothermal heat pump condenser.

2.04 FABRICATION

- A. Cabinet: Steel with baked enamel finish, including access panels with screwdriver operated flush cam type fasteners. Structural members shall be minimum 18 gauge, 0.0478 inch, with access doors or panels of minimum 20 gauge, 0.0359 inch.
- B. Supply Fan: Backward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive with VFD for variable flow; see Section 23 0548. Isolate complete fan assembly.
- C. Exhaust Fan: Forward curved centrifugal type, resiliently mounted with V-belt drive, adjustable variable pitch pulley, and rubber isolated hinge mounted high efficiency motor or direct drive with VFD for variable flow; see Section 23 0548. Isolate complete fan assembly.
- D. Air Filters:
 1. 2 inch thick glass fiber disposable media in metal frames.
- E. Roof Mounting Curb: 14 inches high galvanized steel, channel frame with gaskets, nailer strips.

2.05 EVAPORATOR COIL

- A. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- B. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons of refrigeration capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons of refrigeration cooling capacity and larger.

2.06 COMPRESSOR

- A. Provide hermetic compressors, 3600 rpm maximum, resiliently mounted with positive lubrication, crankcase heater, high and low pressure safety controls, motor overload protection, suction and discharge service valves and gauge ports, and filter drier.
 - 1. Variable capacity.
- B. For heat pump units, provide reversing valve, suction line accumulator, discharge muffler, flow control check valve, and solid-state defrost control utilizing thermistors.

2.07 MIXED AIR CASING

- A. Dampers: Provide outside, return, and relief dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper to fall to closed position. Relief dampers may be gravity balanced.
- B. Gaskets: Provide tight fitting dampers with edge gaskets.
- C. Damper Operator, Units With 7.5 Tons of refrigeration Cooling Capacity and Larger: 24 volt with gear train sealed in oil with spring return on.

2.08 OPERATING CONTROLS

- A. Provide terminal strip on unit for connection of operating controls to remote panel by others. Control shall allow for minimum two stages of heating and two stages cooling.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that proper power supply is available.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Mount units on roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.
- C. Connect ducts to RTUs with flexible duct connectors.
- D. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.

3.03 SYSTEM STARTUP

- A. Provide manufacturer's field representative to perform systems startup.
- B. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
- C. Prepare and start equipment. Adjust for proper operation.

END OF SECTION

SECTION 23 8200 - CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic or steam cabinet unit heaters.
- B. Duct-mounted coils.

1.02 RELATED REQUIREMENTS

- A. Section 23 2213 - Steam and Condensate Heating Piping.
- B. Section 23 2214 - Steam and Condensate Heating Specialties.
- C. Section 23 3100 - HVAC Ducts and Casings.

1.03 REFERENCE STANDARDS

- A. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Shop Drawings:
 - 1. Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
 - 2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
 - 3. Submit the following for blower-coil units indicating:
 - a. Overall dimensions including installation, operation, and service clearances.
 - b. Fan curves with specified operating point clearly plotted.
- D. Selection Samples: For each finish product specified, color chart representing manufacturer's full range of available colors.
- E. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.
- F. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements for additional provisions.
 - 2. Extra Filters: Three sets of each type and size.

1.05 WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 HYDRONIC CABINET UNIT HEATERS

- A. Manufacturers:
 - 1. Daiken Applied; www.daikenapplied.com/products/fan-coils/unit-heaters/#sle.
 - 2. Modine Manufacturing Company: www.modineHVAC.com/#sle.
 - 3. Sigma Convector Enclosure Corp.; www.sigmaproducts.com/#sle
 - 4. Sterling Hydronics a Mestek Company: www.sterlingheat.com/#sle.
 - 5. Trane Technologies, PLC: www.trane.com/#sle.
 - 6. Vulcan Radiator, a Mestek Company: www.vulcanrad.com/#sle.
 - 7. Substitutions: See Section 23 0500 - HVAC General Provisions.
- B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.
- C. Coils:
 - 1. Evenly spaced aluminum fins mechanically bonded to copper tubes.
 - 2. Heating Hot Water: Suitable for working temperatures up to a maximum not less than 200 degrees F.
- D. Cabinet: Minimum 16 gauge, 0.0598 inch thick sheet steel front panel with exposed corners and edges rounded, easily removed panels, glass fiber insulation, integral air outlet, and inlet grilles.
- E. Finish: Factory applied baked enamel of color as selected on visible surfaces of enclosure or cabinet.
- F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.
- G. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.
- H. Control: Factory wired, solid state, infinite speed control, located in cabinet.
- I. Filter: Easily removed, 1 inch thick glass fiber throw-away type, located to filter air before coil.
- J. Electrical Characteristics: Factory wire motors and controls for a single field connection.

2.02 DUCT-MOUNTED COILS

- A. Water Coils:
 - 1. Manufacturers:
 - a. Carrier Corporation: www.commercial.carrier.com/#sle.
 - b. Daikin Applied: www.daikinapplied.com/#sle.
 - c. Greenheck Fan Corporation; www.greenheck.com/products/#sle
 - d. Trane Technologies, PLC: www.trane.com/#sle.
 - e. USA Coil & Air: www.usacoil.com/#sle.
 - f. Johnson Controls International, PLC: www.johnsoncontrols.com/#sle.
 - g. Substitutions: See Section 23 0500 - HVAC General Provisions.
 - 2. Coils rated and tested in accordance with AHRI 410.
 - 3. Tubes: Material to consist of seamless copper or brass, mechanically expanded or tension wound to fins; appropriate tube joining methods based on tube material.
 - 4. Fins: Material to consist of aluminum or copper, continuous plate type with full fin collars or individual helical finned tube type wound under tension.
 - 5. Casing: Heavy gauge galvanized steel with mounting holes, including intermediate tube supports if required by coil design and length.

6. Headers (Manifolds): Construct of seamless copper pipe, cast iron, or nonferrous material with tube connection appropriate to header material provided.
7. Acceptable Factory Testing Methods:
 - a. Perform hydrostatic testing for coils with removable headers in accordance with approved shop drawings and normally accepted means and methods.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are suitable for installation.
- B. Verify that field measurements are as indicated on drawings.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's recommendations.
- B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.
- C. Cabinet Unit Heaters:
 1. Coordinate to ensure correct recess size for recessed units.
- D. Units with Hydronic Coils:
 1. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
 2. If not easily accessible, extend air vent to exterior surface of cabinet for ease of servicing.
 3. Provide manual air vents with stop valve for cabinet unit heaters, fan coil units, and unit heaters.
- E. Units with Cooling Coils: Connect drain pan to condensate drain.
- F. Air Coils:
 1. Install in ducts and casings in accordance with SMACNA (DCS).
 - a. Support coil sections independent of piping and secure to duct.
 - b. Arrange supports to avoid piercing drain pans.
 - c. Provide airtight seals between coil and duct.
 - d. See Section 23 3100.
 2. Coil Safeguards:
 - a. Protect coils to prevent damage to flanges and fins.
 - b. Comb out damaged fins.
 3. Install all coils level except cleanable coils with 1:50 pitch.
 4. Make connections to hydronic and steam coils with unions and flanges.
 5. Hydronic (Drainable) Coils:
 - a. Connect water supply to leaving air side of coil (counterflow arrangement).
 - b. Provide with shut-off valve on supply piping and tamper-proof, balancing valve with memory stop on return piping.
 - c. Locate supply water connection on leaving air side at bottom of supply header, and return water connection at top.
 - d. Provide manual air vents with stop valves at high points.
 - 1) Install drain connections at low points of installation.
 - 2) See Section 23 2113 and Section 23 2114.

3.03 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Test and inspect in accordance with manufacturer's recommendations/check list.

3.04 CLEANING

- A. After construction and painting is completed, clean exposed surfaces of units.
- B. Vacuum clean coils and inside of units.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.
- D. Install new filters.

3.05 CLOSEOUT ACTIVITIES

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

3.06 PROTECTION

- A. Provide finished cabinet units with protective covers during the balance of construction.

3.07 EQUIPMENT SCHEDULES

END OF SECTION

SECTION 26 0500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

1.1 DESCRIPTION

A. Specification Format

1. These Specifications are written in imperative and abbreviated form. This imperative language of the technical sections is directed at the Contractors, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "the Contractor shall", and "shall be", and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, perform all indicated requirements whether stated imperatively or otherwise.
2. Three Part Format
 - a. "Part 1.0 - General": Covers those areas which relate to the Work, and which define the general administrative and technical requirements specific to a particular section.
 - b. "Part 2.0 - Products": Defines, in detail, the acceptance equipment and materials to be incorporated into the Work.
 - c. "Part 3.0 - Execution": Describes, in detail, the manner in which items covered by Part 2 are to be incorporated into the Work.
3. Where Codes, Specifications and Drawings are in conflict, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies immediately to the Engineer prior to commencing related work.

B. Definitions

1. "Furnish" - Supply equipment as required by these Drawings and Specifications, delivered to the job site for installation or use by others.
2. "Install" - Fix in position for total operational use all apparatus as shown, specified or required. Provide all miscellaneous fittings and wiring supplies.
3. "Or Approved Equal" - Equipment or materials selected by Contractor subject to Engineer's acceptance.
4. "Or Equivalent" - Equipment or materials selected by Contractor matching the function and performance of equipment or materials listed.
5. "Provide" - Furnish and install in place, total and operational.
6. "Manufacturer's Representative" – person properly trained/certified for the specific equipment and a regular employee of the Manufacturer, the Manufacturer's Representative Agency, a third party specializing company, or the selling distributor.
7. "Substantial Completion" - The date when the project has been completed, inspected, and accepted by the Engineer and Owner.

C. Work Included

1. Provide labor, equipment and materials in connection with Work specified and shown on Drawings.
2. Work of this Division is subject to requirements of Instructions to Bidders, General Conditions, Supplementary Conditions, Division One, and all other sections of this Specification.
3. Examine site and all Contract documents prior to submittal of bid.

D. Work Installed But Furnished Under Other Directives

1. Provide service for electrically operated equipment not specified in Division 26, 27 & 28. Verify size and locations of such connections by securing all rough-in requirements from the equipment supplier.
2. Equipment requiring electrical service shall be furnished with motors, special controls and remote electrical devices as specified in other Divisions.
3. Verify extent of controls and devices furnished by referring to Divisions where Work is specified.
4. Provide disconnects, starters, control devices, thermal units, fuses, switches and all necessary power and control wiring. Include the installation of remote electrical devices furnished separately with the equipment. Provide identification for remote devices as directed by the Engineer.
5. Contractors of other Divisions providing electrically operated equipment shall verify with the Electrical Contractor the proper voltage and phase before releasing equipment for shipment.
6. Unless otherwise specified, Contractor responsible for furnishing such equipment is also responsible for setting in place.

1.2 ALTERNATES

A. General

1. The work of this Section is affected by the Alternates described in this Specification.

B. Alternate E-1

1. The Owner wishes to know in advance the possible cost to remodel the second floor
2. Base Bid: No additional work on the second floor.
3. Under Alternate Bid E-1 on the Bid Form, state the Contract Sum to remodel the second floor as shown on the drawings.

1.3 CONTINGENCY

- A. Use contingency only on issuance of Change Orders.**
- B. Refer to Division 1 for the amount to include in the Electrical Bid.**
- C. Money remaining in contingency at close of project will be credited to the Owner by Change Order.**

1.4 SUBMITTALS

A. Substitution and Prior Approval to Quote.

1. The reference to manufacturer's name and catalog or model numbers shall be interpreted as establishing a standard of quality, not as limiting competition.
2. Suppliers wishing to price material or equipment not referenced in Specifications or on Drawings shall apply in writing to Engineer for approval to quote. Electronic submittals shall be in PDF format. Include complete descriptive technical data on the proposed item consisting of: model numbers, type, size and performance characteristics. Procedure also applies to requests by Contractor. Self-addressed, stamped envelope required for return reply.
3. The request for prior approval to quote shall be received in Engineer's office no later than 192 hours (eight days) prior to bid opening. All substitute items approved for quotation will be listed in Addenda sent to all planholders in advance of bid opening.

4. Contractors choosing to use material or equipment other than those shown on Drawings or specified in detail, but approved for quotation, shall be responsible for physical dimensions and coordination. Architect, Engineer, or Owner will not be responsible for costs of necessary changes and additional work required by Contractor or any other trades.
5. Substitutions will not be permitted after bid opening.

B. Correspondence

1. Direct all correspondence concerning Division 26, 27, & 28 submittals to:

Thomas Keeling
PRAIRIE ENGINEERING, P.C.
1905 17TH ST SE
MINOT, ND 58701
tkeeling@prairieengineeringpc.com

C. Shop Drawings

1. Before any of the materials are delivered to the job, submit to Engineer via the Prime Contractor complete Shop Drawings for each item indicated.
2. Include catalog numbers, performance data, dimensions and other descriptive information.
 - a. The actual part numbers and options for equipment to be utilized shall be highlighted to indicate exact equipment to be furnished.
 - b. Only include information relevant to the equipment being provided. Any extraneous materials shall be removed prior to submittal.
3. Shop Drawings shall be in electronic PDF format and shall include catalog sheets showing all necessary information. Shop drawings shall be separated by specification section, and equipment from separate specification sections shall not be combined.
4. Shop Drawings shall be submitted under the appropriate specification section of the electronic submittal service being used. The shop drawing file for each section shall include the specification section number, section name, and revision number. Example: "262726 Wiring Devices REV 01".
 - a. If an electronic submittal service is not being used, shop drawings may be emailed to the Engineer at the email address indicated above. Emailed shop drawings shall not exceed 10 MB. If shop drawings exceed 10 MB, contact the Engineer to arrange for a file transmittal method.
5. Each Shop Drawing folder shall be **stamped, initialed, and dated**, on a cover sheet included in the PDF submittal by Division 26 Contractor to indicate they have thoroughly reviewed them in accordance with General Conditions. **Email message text not acceptable.**
 - a. If the Division 26 contractor is under a Prime Contractor, the Prime Contractor may also include a review stamp. However this does not relieve the Division 26 contractor from applying their review stamp.
6. Shop Drawings not in conformance with Specification will be returned to Prime Contractor without review.
7. A maximum of two reviews will be completed for each section. Additional submittals required due to lack of proper corrections being made may be subjected to review fees from the Engineer billed to the Division 26 contractor.

D. As-Built Drawings

1. Designate one set of clean blueprints at project site as As-Built Drawings. Make As-Built Drawings available to Engineer during project visitation.
2. As work progresses, Contractor's field supervisor shall mark As-Built Drawings in red pencil to indicate actual conditions of installation.
3. Show same general details as Drawings.
4. Give particular attention to marking actual locations of feeders and underground runs.
5. Affix all addendum and change order descriptions to appropriate as-built drawing sheet, utilizing spray adhesive.
6. Submit As-Built Drawings to Engineer along with Record Manuals at close of project in PDF format.
 - a. As-Built Drawings shall be submitted as one PDF file.
 - b. Record Manuals shall be submitted as one PDF file.
7. Provide minimum one hard copy of As-Built Drawings to the Owner.
8. Review Division 1 for additional requirements for hard copies of As-Built Drawings.

E. Record Manuals

1. Upon completion of Work of this Division and as condition of its acceptance, Contractor shall compile Record Manuals.
 - a. List project name, date, Contractor's name, address and telephone number on exterior label of each Record Manual.
 - b. Provide one electric PDF copy to Engineer for review.
 - 1) After electronic PDF copy is reviewed and approved, provide one hard copy of Record Manual to Owner. Include an index sheet indicating each major piece of equipment, supplier and supplier's telephone number. Provide tabbed dividers indicating major groupings of equipment.
 - 2) Review Division 1 for additional requirements for hard copies of Record Manuals.
 - c. Record Manual information shall be included for all equipment/material where Shop Drawings are required. **Also include all installation, operation and maintenance data packaged with any equipment.**
2. Turn over to Owner all spare equipment and devices specified and shown. List quantities on contractor letterhead or invoice, obtain signature of Owner's representative acknowledging receipt, and include with each Record Manual.
3. Include one copy of formal instructional recordings, properly identified as to specification section.
4. Include copy of State Electrical Board Wiring Certificate in each Record Manual.
5. Include service equipment fault current calculation and step-down transformer fault current calculations in record manuals. Utility transformer fault current shall be calculated per Section 260553-3.3. Step-down transformer fault current shall be calculated per Section 262200-1.2. Provide in tabular form, as per the following example:

Transformer	kVA	Sec. Voltage	Phase	Impedance	Fault Current	Date Calculated
Utility	300	480	3	1.06%	34,043 amps	11/15/2016
T-1	150	208	3	3.8%	10,958 amps	11/15/2016

6. Calculate the available fault current (AFC) for the mechanical and electrical equipment listed and provide the information in tabular form, utilizing naming convention on the drawings.
 - a. HVAC Equipment 1HP and larger
 - b. Refrigeration Equipment

- c. Elevator Equipment
- d. Industrial Control Panels
- e. Electrical Distribution Equipment
- f. Branch Panelboards
- g. MCC's.

7. Fault Current Table Format Example:

Equipment	Voltage	Phase	AFC at Equip.	Date Calculated
AH-1	480	3	5,289 amps	11/15/2016
CU-1	208	3	2,321 amps	11/15/2016

8. Transformer fault current table and equipment fault current calculation table shall be grouped together in the same tabbed section of the record manuals.

1.5 QUALITY ASSURANCE

A. Qualifications of Installers

1. For installation and testing, use only trained licensed and experienced workmen familiar with items required and manufacturer's recommended methods.
2. In acceptance or rejection of installed work, no allowance will be made for lack of skill on the part of the workmen.
3. To the maximum extent possible, retain the same supervisory personnel throughout the duration of the Work.

B. Licenses, Permits, Codes and Standards

1. Materials, workmanship and installation: comply with the latest editions of all applicable codes, local ordinances, industry standards, utility company regulations, insurance carrier requirements and these Specifications.
2. Codes and standards shall include, but not necessarily be limited to, the following:
 - a. Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL)
 - b. National Electrical Code (NEC)
 - c. National Fire Protection Association (NFPA)
 - d. Occupational Safety and Health Act (OSHA)
 - e. State and local wiring standards
 - f. Building and fire codes
3. The more stringent provisions shall govern where provisions of pertinent codes and standards conflict with these Specifications or Drawings. Where Codes, Specifications or Drawings differ with one another, the Contractor will be deemed to have bid the more expensive method. Refer all such discrepancies to the Engineer immediately.
4. Pertinent codes and standards shall not be cited to furnish less than specifically shown or specified.
5. Obtain and pay all permits, inspections, licenses and other charges pertaining to the Work. Upon completion of the Work, furnish proof of acceptance by proper agency having jurisdiction.

1.6 GUARANTEE AND WARRANTY

- A. Unless otherwise modified by other sections of this specification, contractor shall guarantee materials, workmanship and the proper operation of equipment for a period of one year. Warranty period shall begin at date of substantial completion, or date of specific equipment commissioning, whichever is later. Contractor shall correct all equipment, material and workmanship found to be defective or non-conforming to the contract documents without cost to Owner.
- B. Guarantee shall include trips to the project site by Contractor to adjust electrical equipment as required, ensuring it is operating as intended.
- C. Specified guarantee shall not relieve Contractor from liability arising from improper installation or non-compliance with applicable codes.
- D. Contractor shall include written warranty statement, indicating start and end dates of warranty period. Warranty statement shall be included with each copy of the Record Manuals.

1.7 CHANGES TO CONTRACT

- A. Any required changes to the contract after bid date shall be in accordance with General Conditions/Division 1 and this section. Where any discrepancies between the sections are encountered, the more restrictive section shall apply.
- B. Proposed changes shall be accompanied with complete substantiating documentation.
 - 1. Provide an itemized list of quantities for materials, equipment, and supplies.
 - a. Include unit costs for each item and extended price.
 - b. Include unit labor for each item and extended time.
 - 2. Provide subcontractor proposals that include the same substantiating documentation.
 - 3. Provide quotations from suppliers for any specially ordered equipment.
- C. Material costs shall be actual costs to the contractor, obtaining the materials through normal supply channels, including trade and quantity discounts. Utilizing "suggested pricing" from national pricing organizations for unit costs shall not be accepted. Upon request, the contractor or subcontractor shall submit evidence to substantiate the costs.
- D. Labor units shall be industry accepted standard labor hours to perform one unit of work. If the work is being performed in a location that is not considered to be standard working conditions for that specific task, additional labor shall be itemized.
- E. Labor rates shall be the actual rate paid for the workman category along with associated labor burden. Labor burden shall consist only of the mandatory fringe benefits, labor taxes, and labor insurances as affected by payroll. The owner reserves the right to reject any labor burden which is inconsistent with other similar contractors or where the fringe benefit cost is in excess of established labor agreements.
- F. Allowable markups for contractor and subcontractors
 - 1. Overhead on work performed by own forces: 12% maximum.
 - 2. Profit on work performed by own forces: 10% maximum
 - 3. Commission on work performed by Subcontractors: 5% maximum
 - 4. Sales tax.
 - 5. Bond and permit increases where applicable.

- G. No additional markups shall be allowed for:
 - 1. Field and/or office supervision/administration time.
 - 2. Tool burden.
 - 3. Shop burden.
 - 4. Overhead/Profit applied to work performed by others.
- H. Additional costs for travel and subsistence shall only be allowed if the proposal includes a request for extension of the completion date. Furthermore, those costs shall be proportional to the number of working days of the extension.
- I. Subcontractors shall compute their costs in the same manner as the contractor. Subcontractors are subject to the same markup constraints as described herein.
- J. For changes resulting in credit to the costs, no restocking fees for materials shall be applied by the contractor or subcontractors.

1.8 TEMPORARY FACILITIES

- A. Refer to Special Conditions and/or Division 1 for details of temporary facilities.

1.9 APPLICATIONS FOR PAYMENT

- A. Refer to Division 1 "Applications for Payment".
- B. Provide one additional copy, sent directly to the Engineer.
- C. Format and content:
 - 1. When included with the Bid, the following categories shall be indicated on the application for payment:
 - a. *Project mobilization.*
 - b. *Demolition.*
 - c. *Service & Distribution* (all switchgear, panels, transformers, motor control centers, and loose control/disconnects, installed in place).
 - d. *Lighting* (all fixtures and lamps, installed in place, including pre-fabricated wiring system).
 - e. *Wiring Devices* (all switches, receptacles, and plates, except voice-data, installed in place).
 - f. *Equipment Connections* (HVAC, elevator, food service, etc, connected in place).
 - g. *Basic Materials* (all conduit, wire, boxes, supports, fittings, grounding materials, except special systems and voice-data cabling systems, installed in place).
 - h. *Fire Alarm & Detection* (all system equipment, installed in place).
 - i. *Special Systems* (all system equipment and cabling, installed in place, broken out by Specification Section. Examples include Clock and Program, Intercom, Nurse Call, Public Address, Sound Reinforcement, Rescue Assistance, TV Signal Cabling, Architectural and Theatrical Lighting Controls, and the like).
 - j. *Generator* (all system equipment, installed in place).
 - k. *Voice-Data Cabling Systems* (all system equipment, installed in place).

PART 2 – PRODUCTS

2.1 MATERIAL

- A. Material and equipment shall be as shown or specified. Provide material not specifically described but required for a complete and proper installation of the Work, subject to the acceptance of the Engineer.
- B. All material and equipment shall be new when delivered to the job and be listed by a Nationally Recognized Testing Laboratory (NRTL).
- C. Owner will not be liable for material installed in non-compliance with codes, standards, and these Contract Documents.

2.2 PRODUCT HANDLING

- A. Protection
 - 1. Use all means necessary to protect the materials of this Division before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 3 – EXECUTION

3.1 GENERAL

- A. Engineer, Architect, or Owner shall not be responsible for the means, methods, techniques, sequences or procedures of construction selected by Contractor.
- B. Engineer, Architect, or Owner shall not be responsible for safety precautions and programs incidental to work of Contractor.
- C. It is the sole responsibility of Contractor to initiate, maintain, and supervise all safety precautions and programs in connection with the Work.

3.2 SURFACE CONDITIONS

- A. Prior to work of each Section of Division 26, 27, & 28, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Verify that work of this Division may be installed in accordance with all pertinent codes, regulations and standards.

3.3 COORDINATION

- A. Order material in a timely fashion to assure it is on the job site when required.

- B. Coordinate installation of material with schedule of other trades to prevent unnecessary delay in construction schedule.

3.4 DISCREPANCIES, CONSTRUCTION CONFLICTS AND DRAWINGS

A. Discrepancies

1. Prior to submitting bid, Contractor shall refer any apparent discrepancies or omissions to Engineer for clarification.
2. The Architect, Engineer or Owner will not be responsible for any oral instructions or modifications to the contract documents prior to opening of bids.
3. Written interpretation or clarification will be made by Addenda.

B. Construction Conflicts

1. Conflicts discovered during construction shall be immediately called to the attention of the Engineer for decision.
2. Do not proceed with installation in area of question until conflict has been fully resolved.
3. When so directed by Engineer, Contractor shall make minor adjustment to avoid interferences with other trades. Such minor adjustments shall be performed at no additional cost to the Architect, Engineer or Owner.

C. Drawings

1. Drawings indicate extent and general layout of electrical systems for project. Due to small scale, it is not possible to indicate all fittings and accessories that may be required. Provide such fittings and accessories as required to form a complete and operating system in general conformance with Specifications and Drawings.
2. Data indicated on Drawings and in these Specifications is as exact as could be secured, but absolute accuracy is not guaranteed.
3. Exact locations, distances, levels and other conditions will be governed by the structure. Field measurements shall take precedence over the Drawings. Use the Drawings and these Specifications for guidance. Secure the Architect's approval for all changes in locations.
4. Verify all measurements at site. No compensation will be made because of difference between locations shown on the Drawings and measurements at the building.
5. Refer to the architectural drawings for dimensions and locations of walls, partitions, doors, windows, ceiling heights, door swings and other details of construction.

3.5 UNDERGROUND UTILITIES

- A. Locations of existing underground utilities are based on available site information and are shown approximately. Contractor shall determine exact utility locations before commencing work and shall be responsible for repair of damages resulting from his construction activities.
- B. Trench and backfill for installation of underground conduits to depth shown or required. Remove any accumulated water in excavation by pumping. Shore and brace excavation as required by safety regulations. Provide temporary bridges to maintain normal traffic flow. Excavation and backfill required by electrical installations shall be accomplished in accordance with Earthwork Specifications by this Contractor.

3.6 CUTTING AND PATCHING

- A. Carefully lay out all work in advance to minimize cutting, channeling or drilling.
- B. Where necessary, all such cutting and patching shall be done in a manner approved by Architect.
- C. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all cost.
- D. Use only rotary type drilling tools to cut concrete.
- E. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.7 TESTS

- A. Perform all tests as required by Engineer during construction and as described in other Sections of these Specifications.
- B. Testing of entire installation shall be completed before final inspection.

3.8 INSTRUCTIONS

- A. After all required approvals of the Work have been obtained; demonstrate the operation and maintenance of all electrical equipment to the Owner's personnel.
- B. Provide written and oral operating and maintenance instructions to Owner's representatives. The oral instructions shall be given before the Owner occupies the buildings. Instructions to include all building's electrical systems and equipment.
- C. Copies of written operating and maintenance instructions shall be included with each Record Manual.
- D. Electrical Contractor shall coordinate with Owner at Owner's convenience, formal instruction time for contractor personnel to instruct Owner's Representatives on all equipment. Provide similar equipment supplier's instructions where specified thus. Formal instruction to occur with each Record Manual, being referenced to and a part of the Manual.
- E. Formal instructions shall be recorded when required by other Sections of this Specification by this Contractor. Format shall be digital media capable of being played on Windows or Mac operating systems, or shall be submitted on a USB storage device.
 - 1. Electronic PDF files for the as-built drawings and record manuals shall also be included on the USB storage device with the formal instructions.

3.9 CLEAN UP

- A. Remove all scrap material left on job during and after installation of Work.
- B. All equipment having finished paint surfaces shall be examined upon completion for scratches and other damage. Touch up all surfaces as required with paint of color to match factory finish.
- C. Perform all cleaning as required by other Sections of Division 26, 27, & 28.

END OF SECTION

SECTION 26 0505 – TEMPORARY FACILITIES & CONTROLS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Temporary electricity.

1.2 PRODUCT HANDLING

A. Protection

1. Use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout the progress of Work.

B. Replacements

1. In the event of loss or damage, immediately make all repairs and replacements necessary at no additional cost to Owner.

PART 2 – PRODUCTS

2.1 UTILITIES

A. Temporary Facilities

1. General: all costs, including utility company charges, required for the performance of temporary electrical system, shall be paid by Electrical Contractor.
2. Energy charges: Refer to Division 1 for requirements.
3. Temporary Electricity: Electrical Contractor shall:
 - a. Furnish and install all necessary temporary wiring.
 - b. Provide area distribution boxes located so the individual trades may use their own construction type extension cords.
 - c. Provide GFCI protection on all temporary power per NEC.

END OF SECTION

SECTION 26 0510 – REMODELING WORK

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide work in remodeled area as shown on Drawings and Specifications.

B. Existing Conditions

1. Visit existing buildings before submitting bid and become familiar with all pertinent existing conditions. Make allowance in bid for all pertinent existing conditions. No Change Orders will be issued:
 - a. For Contractor's failure to visit site and acquaint himself with existing conditions.
 - b. For any portion of remodeled work necessary for complete installation of systems shown.
 - c. Due to Contractor's lack of understanding of amount of work or difficulty of work involved.

PART 2 – PRODUCTS

2.1 See following sections of this Specification.

PART 3 – EXECUTION

3.1 GENERAL

- A. Wiring in existing building shall remain except as noted on Drawings or specified.
- B. Verify existing conditions relative to work involved and make allowances thereto.
- C. Balance additional loads to existing circuitry between phases.
- D. Furnish a revised, typed panel directory on existing panelboards where circuitry is changed.

3.2 CUTTING AND PATCHING

- A. Carefully lay out all work in advance to minimize cutting, channeling or drilling.
- B. Where necessary, all such cutting and patching shall be done in a manner approved by Architect.
- C. Restore damaged surfaces to their original condition by skilled mechanics of the trade involved. Contractor at fault shall assume all costs.
- D. Use only rotary type drilling tools to cut concrete.
- E. Do not endanger the stability of the structure. Do not at any time cut or alter work of any other Contractor without Architect's consent.

3.3 REMOVAL AND/OR REUSE OF EXISTING MATERIALS AND EQUIPMENT

- A. Remove or relocate existing conduits, wires, equipment, devices or fixtures indicated on Drawings or as required.
- B. Remove any existing non-active voice/data cables including trunk cables, and any other special systems cables in the entirety. Verify with Owner prior to removal.
- C. Remove any existing exposed abandoned raceways, including those above accessible ceiling finishes in their entirety. Verify with Owner prior to removal. Where complete conduit removal is not feasible, cut conduit flush with walls and floors, and patch surfaces.
- D. Provide additional code-mandated supports on any remaining (existing prior to project and located within the remodel area) unsupported raceway systems or communications cabling including fiber optic, voice/data and special systems.
- E. Where existing multi-wire lighting and power branch circuits are modified in any way, it is this Contractor's responsibility to provide additional grounded (neutral) conductors as required between the electrical panelboard and existing circuit devices. Circuit breaker tie-handles are not acceptable. In the event that existing raceways are not properly sized to accommodate the required additional conductors, new raceway shall be installed.
- F. Where the reuse of existing conduits, wires, and devices, or fixtures is permissible, verify that wiring is continuous. Existing outlet or junction boxes shall not be rendered inaccessible by structural changes made to the building.
- G. Verify that no devices are cut off from power source unless specifically noted.
- H. Existing equipment which is indicated as being removed and not indicated for reuse shall remain the property of the Owner, stored as directed. Remove and dispose any material the Owner does not wish to retain, except fluorescent lamps and ballasts.
- I. Do not break, dump or otherwise destroy removed fluorescent and HID lamps, due to possible mercury contamination. Removed lamps are to be recycled and converted by an EPA-Licensed company regularly engaged in this business, and offering this service in accordance with all EPA, State, and Local Regulations:

Green Lights Recycling, Inc.
10040 Davenport Street NE
Blaine, MN 55449
(763) 785-0456

Recycle Technologies
4000 Winnetka Ave. N
Minneapolis, MN 55427
(800) 969-5166

Waste Management Lamp Tracker, Inc.
10050 Naples St NE
Blain, MN 55449
(800) 664-1434

or equivalent as selected by the Contractor.

All associated recycling costs shall be included in this Contract. Recycler shall provide Owner with a Certificate of Conversion, indicating Owner's manifested lamps have been properly recycled and converted. Comply with recycler's packing and shipping instructions.

- J. Do not dump or otherwise destroy removed ballasts, due to possible PCB contamination. Removed ballasts are to be destroyed by an EPA Licensed company regularly engaged in this business, and offering this service in accordance with all EPA, State, and Local Regulations:

Green Lights Recycling, Inc.
10040 Davenport Street NE
Blaine, MN 55449
(763) 785-0456

Recycle Technologies
4000 Winnetka Ave. N
Minneapolis, MN 55427
(800) 969-5166

Waste Management Lamp Tracker, Inc.
10050 Naples St NE
Blain, MN 55449
(800) 664-1434

or equivalent as selected by the Contractor

All associated destruction costs shall be included in this Contract. Recycler shall provide Owner with a Certificate of Destruction, indicating Owner's manifested ballasts have been properly destroyed. Comply with packing and shipping instructions.

- K. Assume existing equipment and fixtures shown to be reused are in good working condition and can be installed without any repairs or, if in unusable condition, notify the Architect for decision. Contractor shall be responsible for any damage by his personnel to equipment in removal or handling.
- L. Provide blank plates as required at existing rough-ins not being re-used.
- M. Clean fixtures and other equipment removed and indicated for reuse. Provide new lamps for reused fixtures.

3.4 CONTINUITY OF SERVICE

- A. Existing building will be in use during construction. Schedule and carry out work for a minimum of inconvenience to the Owner.
- B. All service interruptions shall require a prior approval by Owner. Confine interruptions to the smallest area possible.
- C. Verify that automatically controlled, electrically operated equipment is returned to the same operating condition which existed prior to interruption.

3.5 ASBESTOS

- A. Contractor is assumed to be knowledgeable about Federal, State, and Local requirements with respect to asbestos issues.
- B. Avoid disturbance of any asbestos-containing material (ACM) within the construction area or elsewhere on the site.

- C. Verify with Owner's "Asbestos Survey and Management Plan" the extent (if any) of existing asbestos.

END OF SECTION

SECTION 26 0519 - CONDUCTORS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide a complete system of conductors enclosed in a raceway.

1.2 SUBMITTALS

A. Record Drawings

1. Maintain accurate record drawings in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 CONDUCTOR

A. Copper

1. Soft drawn, annealed.
2. Conductivity of not less than 98% pure copper.
3. Insulated for 600 volt service.
4. #10 AWG and smaller: Solid, THWN/THHN.
5. #8 AWG and larger: Stranded, THWN/THHN.
6. Provide USE where required by Code.

B. MC Cable

1. MC cable is not acceptable for use as a wiring method.

2.2 VARIABLE FREQUENCY DRIVE (VFD) CABLE

- A. Non-armored, Type TC cable with 85 percent tinned copper braid, 100 percent foil shield, and full size copper drain wire.
- B. XLPE conductor insulation for 600 volt service.
- C. Manufacturer: Belden 29500 series or equivalent.

2.3 SPLICES

- A. #10 AWG and smaller: Scotchlock Y, R or G as manufactured by 3M Company, or equivalent.
- B. #8 AWG and larger: Compression type, as manufactured by Anderson, Burndy, Thomas and Betts Company, or equivalent.

2.4 LUBRICANT

A. General

1. NRTL-listed.
2. Flame resistant
3. Compatible with conductor insulation.

B. Acceptable Manufacturer

1. As selected by Contractor.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

1. Install in accordance with Code, product listing, and manufacturer's recommendations.
2. Install wire and cable in Code-conforming raceways after moisture and debris is swabbed from conduit.
3. Refer to system specified for conductor's peculiar to that system.
4. Conductor sizes: Standard AWG, #12 minimum unless otherwise indicated.
5. Fixture taps: minimum #16 AWG.
6. Conductor temperature ratings: Compatible with the equipment to which it is to be connected. Refer to product listing.
7. Make conductor length for parallel feeders identical.
8. Derate ampacities as required for high ambient temperatures or conductor fill.

B. Color

1. Multi-wire (shared neutral) circuits.
 - a. 120/208 volt
 - 1) Phase conductors: Black, red or blue.
 - 2) Grounded conductor (neutral): White.
 - 3) Grounding conductor: Green or bare.
 - b. 277/480 volt
 - 1) Phase conductors: Brown, orange or yellow
 - 2) Grounded conductor (neutral): Gray
 - 3) Grounding conductor: Green or bare.
2. Separate neutral circuits:
 - a. 120/208 volt
 - 1) Phase conductors: Black, red or blue.
 - 2) Grounded conductor (neutral): White with stripe colored to match phase.
 - 3) Grounding conductor: Green or bare
 - b. 277/480 volt
 - 1) Phase conductors: Brown, orange or yellow.
 - 2) Grounded conductor (neutral): Gray with stripe colored to match phase.
 - 3) Grounding conductor: Green or bare
3. Switch legs: Same as phase conductors.
4. 120 volt isolated ground circuits:

- a. Phase conductor: Orange.
- b. Grounded conductor (neutral): White with orange stripe.
- c. Grounding conductor: Green with yellow stripe.

C. Splices

- 1. Eliminate wherever possible.
- 2. Made only at outlet or junction boxes.
- 3. Obtain special permission from Engineer for any splices in feeder conductors.

D. Voltage Drop

- 1. Increase size of circuit wiring in accordance with NEC 210.19(A)(1), fine print note, No. 4.
- 2. Use #10 AWG minimum for all home run conductors longer than 75 feet on 120/208/240 systems and 150 feet on 277/480 systems.

E. VFD Cable

- 1. Install cable from load terminals of VFD to motor.
- 2. Enclose cable in raceway system (conduit and flexible conduit).
- 3. Terminate the drain wire to the ground lug at both the VFD and the motor.

3.2 TESTS

- A. After equipment and wiring is installed, and before it is energized, test all power circuits with a megohmmeter for insulation resistance, phase-to-phase and phase-to-ground faults.
- B. Before testing, disconnect all equipment that might be damaged by the test voltages.

END OF SECTION

SECTION 26 0526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Bond and ground all electrical equipment in accordance with National Electrical Code, State/Local Codes, these Specifications and as shown on Drawings.

B. Description of System

1. The service equipment, conduit systems, supports, cabinets and neutral conductor shall be solidly grounded and bonded in accordance with National Electrical Code to form a permanent effective and continuous grounded system.

PART 2 – PRODUCTS

2.1 GROUND RODS

- A. Steel with a metallurgically bonded outer layer of electrolytically applied copper.
- B. Minimum 1/2" diameter 10 foot length, unless otherwise indicated.
- C. Sectional rods not permitted.
- D. Manufacturer: ERITECH or equivalent.

2.2 GROUND ROD CLAMPS

- A. Ground rod clamps shall be high strength silicone bronze.
- B. Manufacturer: ERITECH or equivalent.
- C. At Contractor's option, exothermic welding (CADWELD) or impact compression (ERITECH Hammerlock) may be used in place of ground rod clamps.

2.3 WATER PIPE GROUND CLAMPS

- A. Steel U-bolt with bronze saddle.
- B. Thomas and Betts Company 3900 series or equivalent.

2.4 REBAR GROUND CLAMPS

- A. Bronze alloy construction.
- B. Sized as required by rebar stub out.

- C. Eritech RC or EK series as required by local authority. Equivalent products by Thomas and Betts acceptable.

PART 3 – EXECUTION

3.1 GENERAL

- A. **Grounding conductors not shown or included on floor plans.**
- B. **When required, increase trade size of raceway accordingly.**
- C. Aluminum not acceptable for use as a grounding conductor.

3.2 SYSTEM GROUNDING

- A. Provide grounding electrode system in accordance with NEC 250.50. If available, each of the items listed in 250.52(A)(1) through (A)(8) shall be bonded together to form grounding electrode system.
- B. Connect grounding electrode conductor to grounded service conductor.
- C. Provide raceway enclosing grounding electrode conductor. If metallic, bond as per NEC 250.64(E). Provide grounding bushing as required complete with jumpers same size as grounding electrode conductor.
- D. To comply with NEC 250.53, provide two ground rods spaced minimum 6'-0" apart.

3.3 EQUIPMENT GROUNDING CONDUCTOR

- A. Non-metallic conduit: Sized in accordance with NEC, except as further modified by this Specification.
- B. Flexible Metal Conduit, Liquidtight Flexible Conduit.
 - 1. Other than for connection of 120 volt recessed luminaires, not acceptable for use as means of grounding.
 - 2. Provide bonding jumper sized in accordance with NEC around all flexible conduits. Use fittings having lugs for termination of jumper.
 - 3. Spiral wrap not acceptable. Lay along surface, secured with cable ties.
 - 4. Bonding jumper maximum length: 6'.
 - 5. Bonding jumper not required where separate equipment grounding conductor is used.
- C. Branch Circuits
 - 1. **Separate equipment grounding conductor required for each raceway.**
 - 2. Size: per NEC 250.122.
 - 3. Bond to grounding bars, junction boxes and luminaire grounding screws.
 - 4. Field install grounding screw in luminaire if not provided by factory.
- D. Feeders
 - 1. **Separate grounding conductor required.**
 - 2. Bond to grounding bars in switchboards, panelboards and motor control centers.
 - 3. Provide grounding bushing at both ends of all feeders utilizing metallic raceway.

- a. Bond to grounding bars at both ends.
 - b. Size bonding jumpers to match equipment grounding conductor.
 - 4. Feeder Equipment Grounding Conductor Size:
 - a. Size per NEC 250.122.
 - b. Copper equivalent ampacity when aluminum phase conductors utilized.
 - 5. Do not splice grounding conductor.
- E. Water Pipe System
- 1. Bond interior metal water piping per NEC Section 250.104(A) if water pipe system is not used as part of grounding electrode system.

END OF SECTION

SECTION 26 0533 - RACEWAYS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide all conduit systems as shown on Drawings or required by Codes and Specifications.

B. Description of System.

1. Provide code-conforming raceway system for all conductors unless specifically noted otherwise by phrase "not in conduit".

1.2 SUBMITTALS

A. Record Drawings

1. Maintain accurate record drawings for all raceway runs in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Metallic conduit and tubing: Allied Tube and Conduit, Republic Conduit, or equivalent.

B. Non-metallic conduit: Carlon Schedule 40 or Schedule 80 where required, Allied Tube and Conduit, Cantex Inc., or equivalent.

C. Flexible metal conduit: Aluminum.

D. Liquidtight, flexible metal conduit: Anaconda Sealtite or equivalent.

E. Fittings

1. Rigid metal conduit: Appleton, Crouse-Hinds, or equivalent. **Pot metal conduit fittings not acceptable.**
2. EMT:
 - a. **Steel.**
 - b. Setscrew or watertight as required.
 - c. Thomas and Betts Company, or equivalent.
 - d. **Pot metal, "Sock-on" and indentor fittings not acceptable.**
3. Flexible metal conduit: STEEL, Thomas and Betts Company XC-400 series, or equivalent.
4. Liquidtight flexible metal conduit:
 - a. **Steel.**
 - b. Straight or angled as required.
 - c. Appleton, Thomas and Betts Company or equivalent.

F. Hangers and Supports

1. As required by Codes and Specifications.
2. Raco, Unistrut, or equivalent.
3. Erico conduit clips, Type 8-M, 12-M and K-8 acceptable for individual branch circuit runs.

G. Metal Surface Raceway

1. Wiremold 500/700 metallic series or equivalent, unless otherwise indicated on Drawings.
2. Provide associated fittings as required.
3. Standard color as selected by the Architect.

H. Wireway

1. NRTL 870 listing throughout, including connectors and fittings.
2. Hinged cover construction.
3. Sealing capability where required.
4. Suitable for "lay-in" installation of conductors.
5. Rust inhibiting phosphatizing undercoat and baked enamel finish.
6. Plated hardware.
7. Square D "Square Duct" or equivalent.

I. Expansion Fittings

1. Metallic: OZ, Thomas and Betts Company, or equivalent.
2. Non-Metallic: Carlon, or equivalent.

J. Firestop Assemblies

1. Firestop systems shall consist of fittings and/or intumescent materials assembled as per UL (or other NRTL) System Details.
2. Product manufacturers: 3M, Chase Technology Corporation, Dow Corning Fire Stop, Hilti, International Protective Coatings Corp. (Flame Safe), Nelson Fire Stop Systems.

K. Thru Wall and Floor Seals

1. OZ-Gedney Type "FSK" or equivalent.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

1. Electrically continuous throughout.
2. Plumb and level.
3. Cut square and reamed smooth.
4. Use commercial bender for offsets and bends.
5. Cap to prevent debris from entering during construction.
6. Swab conduit prior to installation of conductor.
7. Provide pull cord in empty conduits.
8. Alter conduit routing to avoid structural obstructions, minimizing crossovers.

9. It is the intent of this Specification to provide reasonable provisions for future expansion of electrical use (See NEC 90.8 and 90.1(B), FPN). Therefore, **install all branch circuit home runs as shown on Drawings. Do not combine home runs or increase quantity of conductors therein.**
 10. Install raceway, conduit and fittings in accordance with Code, NRTL listing and manufacturer's recommendations.
- B. Concealed Interior Raceway
1. Conceal all raceway within building construction.
 2. May be run in a direct line for Contractor's convenience.
 3. For Contractor's convenience, **concealed** stubs from concrete-encased PVC conduit runs may extend to first **concealed** junction box.
 4. Where applicable, center within insulation any electrical conduit routed in attic space. Provide sealing as per NEC 300.7(A) for all conduits exposed to different temperatures.
- C. Exposed Interior Raceway
1. Use limited to mechanical and electrical equipment rooms, motor connections, and panelboards scheduled as surface.
 - a. Run parallel or perpendicular to building lines.
 - b. **Provide RGSC or EMT stubs for concrete-encased PVC conduit runs.** Extend stub from RGSC coupling set flush in floor.
 - c. Provide flexible conduit as required for motor and equipment connections.
 2. Shall not be used in finished areas unless specific permission is obtained from Engineer.
 - a. Exposed interior raceway in finished spaces shall be Metal Surface Raceway. Metallic conduit and tubing NOT ALLOWED.
- D. Concrete Encased Raceway
1. Shall not interfere with structural integrity of slab, column, or beam.
 2. Installation subject to acceptance of Structural Engineer.
 3. Maximum diameter 1/3 thickness of concrete member.
 4. Install in center of section.
 5. Provide expansion fitting when crossing building expansion joint. Grounding integrity of raceway to be maintained.
- E. Exterior Raceway
1. Minimum 24" below grade.
 2. PVC unless otherwise indicated.
 3. **Exterior surface stubs for PVC conduit runs: RGSC, including final underground sweep.** Exterior surface stubs acceptable only where specifically shown.
 4. Penetrating Watertight Walls or Floors: Provide block-out with 1/2" clearance around conduit for underground penetrations. Pack with Oakum and caulk with non-shrinking grout, or provide conduit entrance seal.
 5. Penetrating Roof or Waterproofing Membranes: Provide flashing and pitch pocket.
 6. Contractor responsible for providing a watertight penetration.
 7. Coat RGSC penetrations with heavy asphaltic-base compound.
 8. Unless otherwise indicated, route exterior conduits to interior distribution equipment concealed under slab.

F. Supports

1. Refer to NEC 300.11
2. **Tie wire supports not acceptable.**
3. Support Spacing: NEC.

G. Specific Locations

1. Allow 6" minimum clearance at flues, steam pipes and heat sources.
2. Conduit visible behind grills and registers: paint black.
3. Seal conduit where leaving heated area and entering unheated area.
4. Penetrating non-watertight walls or floors: Pack space between conduit and block-out on both sides with Oakum.
5. Penetrating fire rated walls or floors: Seal to prevent passage of fire or products of combustion.
6. From each flush mounted panel location, stub three additional 3/4" conduits into nearest accessible ceiling space.
7. Do not mount raceway on ductwork, cover access doors, panels, controls, or otherwise hinder normal maintenance and repair of the equipment.
8. Motors:
 - a. Connect to motor feeder or branch circuit by means of flexible metal conduit or liquidtight flexible metal conduit in moist areas.
 - b. Minimum flexible length: 18".
 - c. Where practical, feed floor mounted motors from raceway installed in or under slab.
 - d. When floor mounted motors are fed overhead, provide required support for raceway. Extend raceway to floor and provide a floor flange. Insert "T" conduit fitting at proper height and extend flexible conduit to motor.

H. Specific Systems

1. Life Safety Branch
 - a. All raceway systems except those embedded directly in earth or concrete, or surface metal raceway systems (wiremold), shall be externally identified by permanent YELLOW paint suitable for the purpose to easily distinguish from other power raceway systems. Items shall be painted prior to installation. In addition to field painted conduit, factory painted conduit as manufactured by Allied Tube & Conduit or equivalent is acceptable.
2. Critical Branch
 - a. All raceway systems except those embedded directly in earth or concrete, or surface metal raceway systems (wiremold), shall be externally identified by permanent ORANGE paint suitable for the purpose to easily distinguish from other power raceway systems. Items shall be painted prior to installation. In addition to field painted conduit, factory painted conduit as manufactured by Allied Tube & Conduit or equivalent is acceptable

3.2 SIZE

A. National Electrical Code, subject to stated minimums.

B. Minimum Size

1. Exterior raceway: 3/4".
2. In or under poured concrete (including precast concrete panels): 3/4".

3. Branch circuit home run: 3/4". Consider home run to include raceway length from panelboard, switchboard, or motor control center to nearest power consuming or switching device on that circuit.
4. Feeders: 3/4".
5. All others not listed: 1/2".

3.3 TYPE

A. Intermediate Metal Conduit (IMC)

1. May be used in place of rigid galvanized steel conduit for Contractor's convenience.
2. Comply with manufacturer's recommendations for bending, threading and cutting operations.
3. Install as specified for rigid galvanized steel conduit.

B. Rigid Galvanized Steel Conduit (RGSC)

1. Use:
 - a. Overhead electric and telephone service entrance. IMC or Aluminum not acceptable for this application.
 - b. All raceway exposed to weather. Aluminum not acceptable for this application.
 - c. Where required by national, state and local codes.
2. Fittings: Threaded except at KO type boxes where double locknut/bushing method acceptable.
3. Waterproof entire length with heavy asphaltic base compound when:
 - a. Embedded directly in earth.
 - b. Embedded in concrete directly in contact with earth, with or without vapor barrier.
 - c. Penetrations run directly from concrete with earth, to soil burial.
4. Factory applied PVC coating acceptable in place of asphaltic base compound.

C. Rigid Non-Metallic Conduit (PVC)

1. Use only in slabs and exterior underground locations. See 3.1 B3, C4 and E3 for limitations.
2. Provide insulating bushing at all terminal adapters.
3. Provide equipment grounding conductor within raceway.
4. Increase trade size accordingly for equipment grounding conductor.
5. Utilize commercial heating element type bending equipment. **Do not use torches to bend PVC conduit.**

D. Electrical Metallic Tubing (EMT)

1. Use in all areas not prohibited by NEC and this Specification.
2. Do not use in concrete slabs on or under grade, or walls under grade.
3. Do not use in exterior underground applications.

E. Flexible Metal Conduit

1. Use for connections to transformers, motors, fixed appliances, recessed luminaires and other equipment as required.
2. Use liquidtight conduit with liquidtight fittings in areas of high moisture content.

F. Metal Surface Raceway

1. Install complete with matching boxes, fittings, and end caps, parallel or perpendicular to building construction.
2. Wire adjacent devices to alternate circuits where metal surface raceway contains devices integral to the channel.
3. Feed from flush connector in wall directly into raceway. Field cut base as required with 1/2" knockout for this purpose. Do not utilize Wiremold catalog #2051H for 2000/2100 series.

G. Fire Resistive Walls and Decks

1. Preserve integrity of fire rating through the use of UL (or other NRTL) Listed firestop assemblies of appropriate penetration type and rating time.
2. Install in accordance with manufacturer's recommendations.
3. All floor to floor penetrations and all wall penetrations into Mechanical, Electrical, and Communications Rooms shall be sealed with 1 hour firestop assemblies unless more stringent rating is required by building codes.
4. Include UL (or other NRTL) firestop assembly sheets and manufacturer product data sheets specifically used with the Project Closeout Documentation.

END OF SECTION

SECTION 26 0534 – OUTLET, PULL AND JUNCTION BOXES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide all outlet, pull and junction boxes complete with associated covers and rings.

B. Work Installed But Furnished Under Other Directives.

1. Obtain manufacturer's backboxes or recommendations for special equipment.

1.2 SUBMITTALS

A. Record Drawings

1. Maintain accurate record drawings in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 CEILING BOXES

A. Flush and Surface

1. 2-1/8" minimum depth.
2. Square or octagon as required.
3. Galvanized steel.
4. Manufacturer: Appleton, Raco, Steel City or equivalent.

2.2 WALL BOXES

A. Flush

1. One and two gang wall boxes: 4" square box, 2-1/8" minimum depth with appropriate plaster or tile ring.
2. More than three gang: Gangable 3-1/2" deep unless wall cavity limits depth to 2-1/2".
3. Use 4-11/16" square boxes where required by Code.
4. Single gang masonry boxes acceptable only for single conduit entrance. Feed-through circuiting not acceptable. Use 4" square box/tile ring for feed-through applications.

B. Surface Mounted Devices

1. 4" square box, 2-1/8" minimum depth with appropriate 1/2" raised cover.
2. Manufacturer: Appleton, B-Line, Raco, Steel City, Wiegmann, or equivalent.

C. Sectional, through wall and handy boxes not acceptable.

2.3 PULL AND JUNCTION BOXES

- A. Galvanized steel with cover.
- B. Size: National Electrical Code.
- C. Manufacturer: Appleton, Raco, Hoffman, Shallbetter, Steel City, Wadsworth or equivalent.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

- 1. Install in accordance with code, product listing and manufacturer's recommendations.
- 2. Install boxes plumb, level and flush with finish surface.
- 3. Support securely and rigidly.
- 4. Verify wall depths to ensure adequate clearance for special backboxes.
- 5. Provide barriers in ganged switch outlets where voltage between adjacent switches exceeds 300 volts.

B. Location

- 1. Governed by structural conditions and obstructions.
- 2. Mount switch outlet on strike side of door, maximum 4" from door opening to first switch. Verify door swing with Architectural Plan.
- 3. Coordinate equipment outlets prior to installation for proper concealment.
- 4. Center outlets with respect to acoustical tile, paneling and furring trim.
- 5. Adjust outlets in masonry or tile construction to horizontal and vertical mortar joints.
- 6. Clear all piping, ductwork and other obstructions.
- 7. For outlet boxes on opposite sides of walls or partitions with separation distances of 24" or less, pack all interconnecting conduits with Duxseal after conductor installation, to prevent sound transmission.
- 8. Outlet boxes improperly located shall be corrected at Contractor's expense.

C. Mounting Heights

- 1. All device mounting heights shall conform to ADA Recommendations. Refer to Standard Electrical Symbol Legend for nominal mounting heights.
- 2. Verify height of all outlets to ensure installation above top of radiation covers, mirrors, counters and any other obstructions that may alter nominal mounting height.
- 3. **Measure from finish floor to centerline of outlet.**
- 4. Mount exterior outlets horizontally. Measure height from nearest interior finish floor below outlet.
- 5. Mount outlet designated AC (above counter) no less than 4" higher than top of countertop backsplash.

D. Fire Resistive Walls and Ceilings

- 1. Penetrations for steel electrical outlet boxes permitted, provided:
 - a. Boxes do not exceed 16 square inches in area.

- b. Area of such openings shall not exceed 100 square inches for any 100 square feet of area.
- c. Outlet boxes on opposite sides of walls or partitions separated by horizontal distance of 24 inches.

E. Pull and Junction Boxes

- 1. Pull and junction boxes are generally not indicated on Drawings.
- 2. Install in accordance with National Electrical Code and as required to facilitate wire pulling.
- 3. Do not install in finished spaces without approval of Engineer.

F. Identification

- 1. Identify pull and junction boxes containing system voltages in excess of 250 volts to ground with voltage markers.
- 2. Voltage markers: Not visible in finished areas.

END OF SECTION

SECTION 26 0536 – CABLE TRAY

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide cable tray systems as shown on Drawings.

B. Description of System.

1. Provide complete cable tray system shown on Drawings and herein specified. System shall be of one manufacturer with all drop-outs, supports, and all other hardware required for a complete, acceptable, and approved system.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Indicate:
 - a. Product dimensions
 - b. Mounting details
 - c. Support hardware

PART 2 – PRODUCTS

2.1 MANUFACTURER

- A. Sizing and design based upon B-Line equipment. B-Line catalog numbers used for reference.
- B. Other acceptable manufacturers: Cablofil, Snake Tray, Mono-Systems, Inc., WBT, or equivalent.

2.2 BASKET TYPE TRAY

- A. ASTM A510 Grade 1008 steel construction with mesh size no larger than 2" x 4".
- B. All welds and edges smoothed free of burrs and sharp edges.
- C. Zinc plated after fabrication.
- D. 4 inch load depth and 8 inch width.
- E. Include black plastic insert wherever cable tray is visible from the floor (not concealed above ceilings).
- F. Manufacturer: B-Line FT Series.

2.3 MISCELLANEOUS PRODUCTS

A. Firestop Assemblies

1. NRTL listed 4" square pathway with intumescent material designed to seal out fire, smoke, and toxic gases.
2. Quantity shall equal or exceed the width of the associated cable tray. i.e. a 6" wide tray requires two pathways.
3. Include mounting accessories as required by application specifics.
4. Manufacturer: EZ Path Series 44, 3M Model PT4SD or approved equal.

B. Equipment Grounding Conductors

1. Required when specified for power circuits.
2. Bond in accordance with NEC 250.96 and 250.102.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install in accordance with NEC and manufacturer's instructions.
- B. Install Basket Type Tray where indicated in all areas except Network Rooms.
- C. Coordinate installation to avoid conflicts with light fixtures, duct work, piping, or other mechanical equipment.
 - 1. Tray does not have to be completely continuous. Section breaks of up to 36" are allowable for ductwork and other mechanical equipment conflicts.
- D. Provide backing for wall-mount track and support for ceiling-mount tray as required.
- E. No exposed hanger rod threads from bracket to a minimum of 6" above top of tray.
- F. Fire Resistive Walls.
 - 1. End cable tray within 6" of each side fire rated walls.
 - 2. Install Firestop Assembly through rated wall as per manufacturer's recommendations.
- G. All floor to floor penetrations and all wall penetrations into Mechanical, Electrical, and Communications Rooms.
 - 1. End cable tray within 6" of each side of penetration.
 - 2. Install Firestop Assembly through floor or wall as per manufacturer's recommendations.

END OF SECTION

SECTION 26 0540 – FLOOR BOXES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide floor boxes complete with devices, fittings and carpet flanges.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Show all details, including dimensions and service fitting repair parts.

B. Record Manuals

1. Submit information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying equipment.

PART 2 – PRODUCTS

2.1 CONCRETE FLOOR SLABS

A. Type A

1. Box
 - a. Listed and evaluated by an NRTL to meet the applicable U.S. safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.
 - b. Classified for use in 1, 1 1/2, and 2 hour fire rated floor systems.
 - c. 8" round with five compartments.
 - d. Construction:
 - 1) Stamped steel with integral intumescent firestop material.
 - 2) Insertion tabs to hold body in place without additional fasteners.
 - 3) Enamel finished interior.
 - e. Device Plates and Accessories:
 - 1) One #68REC two 20 amp duplex prewired receptacles.
 - 2) One #8ACT8A communications mounting plate.
 - 3) One #8TRAC communications mounting plate.
 - 4) One #8SER communications mounting plate.
 - 5) One #8DEC decorator style mounting plate with four data jacks.
 - a) If Panduit Mini-Com Modules are being supplied, provide Panduit #CFG series 4-module frame.
 - 6) One #575CHA bottom housing assembly.
 - 7) One #5BLH bottom housing assembly.
 - 8) Three #1PTHA bottom housing assembly.
 - 9) One #175CHA-LJB bottom housing assembly.
 - 10) One #22CHA bottom housing assembly.

- 11) One #1100CHA bottom housing assembly.
- f. Die cast aluminum, round activation cover.
 - 1) Surface mount flange to accommodate carpet floor finish.
 - 2) Finish as selected by the Architect.
 - a) Powder coat finish: Black, Bronze, or Gray.
 - b) Metallic finish: Brushed Aluminum, Satin Brass, or Satin Nickel.
- g. Manufacturer: Wiremold Evolution series.

B. Type B

1. Box
 - a. Listed and evaluated by an NRTL to meet the applicable U.S. safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.
 - b. Classified for use in 1, 1 1/2, and 2 hour fire rated floor systems.
 - c. 8" round with five compartments.
 - d. Construction:
 - 1) Stamped steel with integral intumescent firestop material.
 - 2) Insertion tabs to hold body in place without additional fasteners.
 - 3) Enamel finished interior.
 - e. Device Plates and Accessories:
 - 1) One #68REC two 20 amp duplex prewired receptacles.
 - 2) One #8ACT8A communications mounting plate.
 - 3) One #8TRAC communications mounting plate.
 - 4) One #8SER communications mounting plate.
 - 5) One #8DEC decorator style mounting plate with four data jacks.
 - a) If Panduit Mini-Com Modules are being supplied, provide Panduit #CFG series 4-module frame.
 - 6) One #575CHA bottom housing assembly.
 - 7) One #5BLH bottom housing assembly.
 - 8) Three #1PTHA bottom housing assembly.
 - 9) One #175CHA-LJB bottom housing assembly.
 - 10) One #22CHA bottom housing assembly.
 - 11) One #1100CHA bottom housing assembly.
 - f. Die cast aluminum, round activation cover.
 - 1) Surface mount flange to accommodate carpet floor finish.
 - 2) Finish as selected by the Architect.
 - a) Powder coat finish: Black, Bronze, or Gray.
 - b) Metallic finish: Brushed Aluminum, Satin Brass, or Satin Nickel.
 - g. Manufacturer: Wiremold Evolution series.

C. Type C

1. Box
 - a. Listed and evaluated by an NRTL to meet the applicable U.S. safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.
 - b. Classified for use in 1, 1 1/2, and 2 hour fire rated floor systems.
 - c. 6" round with three compartments.
 - d. Construction:
 - 1) Stamped steel with integral intumescent firestop material.
 - 2) Insertion tabs to hold body in place without additional fasteners.
 - 3) Enamel finished interior.
 - e. Device Plates and Accessories:

- 1) One #68REC two 20 amp duplex prewired receptacles.
- 2) One #8DEC decorator style mounting plate with four data jacks.
 - a) If Panduit Mini-Com Modules are being supplied, provide Panduit #CFG series 4-module frame.
- 3) One #575CHA bottom housing assembly.
- 4) One #5BLH bottom housing assembly.
- 5) Three #1PTHA bottom housing assembly.
- f. Die cast aluminum, round activation cover.
 - 1) Surface mount flange to accommodate carpet floor finish.
 - 2) Finish as selected by the Architect.
 - a) Powder coat finish: Black, Bronze, or Gray.
 - b) Metallic finish: Brushed Aluminum, Satin Brass, or Satin Nickel.
- g. Manufacturer: Wiremold Evolution series.

D. Type D

1. Box
 - a. Listed and evaluated by an NRTL to meet the applicable U.S. safety standards for scrub water exclusion when used on tile, terrazzo, wood, and carpet covered floors.
 - b. Construction:
 - 1) Stamped steel, 3.75" overall height with 3/4" to 1-1/4" side knockouts and 3/4" to 1-1/2" bottom knockouts.
 - a) Provide optional 2" threaded hub adapter as required.
 - c. Provide epoxy coating for specific installations where the box is in direct contact with earth.
 - d. Four independent wiring compartments that allow capacity for up to four duplex receptacles and/or communication services.
 - e. Feed through removable barriers from adjacent compartments.
 - f. Internal power and communication device brackets as required by specified internal device types and quantities. Provide internal blank plates for all unused compartments.
 - g. Manufacturer: Wiremold #RFBA4C series.
2. Activation Kit (Cover)
 - a. Die cast aluminum, low profile, round cover with beveled edge flange to sit on top of floor covering.
 - b. Finish as selected by the Architect.
 - 1) Powder coat finish: Black, Bronze, or Gray.
 - 2) Metallic finish: Brushed Aluminum, Satin Brass, or Satin Nickel.
 - c. Manufacturer: Wiremold #6CTC2 series.

2.2 DEVICE QUANTITIES

- A. Type A: Two duplex receptacles, two data jacks, one XI/HDMI input, one mic input.
- B. Type B: Two duplex receptacle, two data jacks, one HDMI input, and one decora plate for future. See Detail 2/E403 or 3/E403.
- C. Type C: Two duplex receptacles, four data jacks.
- D. Type D: Two duplex receptacles, four data jacks, and two decora plates for devices by others.

2.3 WIRING DEVICES

- A. Power: Receptacles as per Section 262726.
- B. Voice/data: Jacks as per Section 271500.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Verify concrete depth prior to ordering floor boxes.
- B. Verify exact location of each floor box with Architect prior to installation.
- C. Install box opening flush with floor in accordance with Code, product listing and manufacturer's recommendations.
- D. Activation Cover Installation
 - 1. Carpet/VCT floor finishes: Install cover after floor covering installation is completed.
 - 2. Tile floor finishes: Install cover prior to tile/grout installation. Shim cover as required so top of cover is flush with floor.
- E. Install floor boxes with square covers parallel or perpendicular to building lines.

END OF SECTION

SECTION 26 0553 - IDENTIFICATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Label electrical equipment as required by Codes and Specifications and as specifically directed by Engineer.

PART 2 – PRODUCTS

2.1 PANEL DIRECTORIES

- ##### **A. Include directory cards with panelboards.**

2.2 NAMEPLATES

- ##### **A. Machine engraved black laminate with white core, except as otherwise indicated.**
- ##### **B. Minimum letter size: 1/8".**
- ##### **C. Minimum plate size: 1" X 3".**

2.3 VOLTAGE MARKERS

- ##### **A. Vinyl impregnated cloth markers with legend as required.**
- ##### **B. Manufacturer: Ideal #44-360, or equivalent.**

2.4 PRESSURE SENSITIVE TAPE

- ##### **A. Use only when specifically referred to in other Sections.**
- ##### **B. Manufacturer: Dymo, or equivalent.**

2.5 UNGROUNDED CONDUCTOR IDENTIFICATION

- ##### **A. As per NEC 210.5(C) and 215.12(C).**
- ##### **B. Typewritten cards behind plastic shield, affixed with double-stick carpet tape. Heat surface prior to affixing directory.**

PART 3 – EXECUTION

3.1 GENERAL

- ##### **A. Directory Cards**

1. **Typewritten only.** Hand lettering unacceptable, except at "spares" and "spaces", where neat hand lettering with erasable pencil is required.
2. Indicate type of load and rooms where load occurs.
3. **Do not use room numbers as shown on Drawings, but refer to name and numbers on door.**
4. Do not identify until final load balancing is accomplished.

B. Nameplates

1. Apply plumb and level with two counter-sunk screws.
2. Glue, double-stick tape, or similar adhesive not acceptable.

C. Device Plates

1. Machine engrave directly on plate in lieu of separate nameplate.
2. Fill inscriptions with contrasting color.

D. Voltage Markers

1. Not visible in finished areas.

E. Junction Boxes

1. Mark all covers with indelible marker to indicate panelboard designation and circuit numbers for circuits contained within box.

3.2 EMERGENCY SYSTEM COMPONENTS

- A. All boxes and enclosures (including transfer switches, generators and power panels) for emergency circuits shall be permanently marked so they will be identified as a component of an emergency circuit for system.

3.3 SERVICE EQUIPMENT FAULT CURRENT NAMEPLATE

- A. Provide warning nameplate on each service disconnecting means enclosure indicating the fault current of the system.
- B. Fault current shall be calculated at the utility transformer, using an assumed infinite primary bus, and using the actual transformer impedance and kVa values.
- C. Red laminate with white core.
- D. Letter height: minimum ¼"
- E. Legend

SERVICE AVAILABLE FAULT CURRENT: _____
TRANSFORMER KVA: _____
TRANSFORMER IMPEDANCE: _____
DATE: _____

END OF SECTION

SECTION 26 0583 – CONNECTIONS TO EQUIPMENT

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. The Contractor shall provide operational electrical connections to all electrically driven or controlled equipment.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General

1. The Contractor shall provide all necessary materials and labor required to make final operational connections to all equipment, generally as shown on the Drawings, and specifically as required by equipment specifications and installation literature.
2. Control devices and panels furnished by others will be delivered to the contractor at the jobsite, and shall be installed in accordance with manufacturer's printed instructions. Review equipment specifications to determine extent of work involved.

PART 3 – EXECUTION

3.1 GENERAL

- A. Provide operational connections for all equipment shown on the Drawings. Connections shall be in accordance with manufacturer's recommendations, and shall be left operating in a manner acceptable to the Engineer and Owner.
- B. Provide available fault current calculations for equipment listed in Section 260500-1.4E based on actual installation criteria (conductor lengths, raceway types, etc.). Calculations shall incorporate the current limiting effects of fuses supplied with local disconnecting means. Include calculation information in Record Manuals.
- C. For all exterior mechanical equipment, provide weatherproof GFCI receptacle outlet within 25' of equipment, circuited to nearest unswitched power. Refer to NEC 210.63 and 406.8.
- D. For all mechanical equipment located in attic and crawl spaces, provide porcelain lamp holder with integral receptacle and lamp guard, circuited to nearest unswitched power via pilot handle toggle switch near access hatch. Engrave plate. Refer to NEC 210.70(C).

3.2 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 26 0943 – NETWORK LIGHTING CONTROL SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. It is the intent of this Specification to provide all necessary equipment as detailed, for a complete lighting control system.
2. The work included under this Specification shall cover:
 - a. All labor, materials and equipment to furnish the lighting control system herein specified.
3. The work shall include the services of a commissioning agent. The commission agent shall be a factory-trained representative who shall commission the system for proper operation and instruct the Owner as to proper operation, programming, and maintenance.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Submit floor plan drawing indicating all device locations and circuitry requirements between devices.
3. Provide connection/riser diagram for specific project involved. Upon Engineer's review, provide **additional three** copies for Contractor use at the project site and for Record Drawing/Manual submittal at project closeout.

B. Manuals

1. Provide information in accordance with Section 260500. Manuals shall include descriptions of equipment and methods of maintenance and operations.

PART 2 – PRODUCTS

2.1 CONTROL SYSTEM COMPONENTS

- A. Component communication shall be by low voltage hard wired protocol and/or by a wireless mesh network.
- B. Switches, modules, and sensors shall be as indicated on the drawings.
 1. Unless otherwise indicated on the Drawings, wall switches for wireless control systems shall be powered by line voltage. Battery powered devices not acceptable.
 2. Battery powered wireless daylight sensors shall be acceptable.
 3. Switching relays that are utilized for emergency egress lighting shall be in conformance with UL 924.

2.2 NETWORK INTERFACE

- A. Provide all hardware to create a fully connected lighting control system that allows for end user access to the connected (wired/wireless) lighting system devices via LAN.
 - 1. Lighting control devices and equipment included in the network shall be as indicated on the Drawings. They shall include, but not be limited to public areas, corridors, stairwells, private spaces, and exterior building/site.
 - 2. Where the system includes wireless devices, include adapter/area modules as required to interface wireless devices with the network. Manufacturer responsible for quantity of modules to ensure coverage of wireless devices.
 - 3. Manufacturer: Cooper WaveLinx CORE system, Lithonia nLight ECLYPSE system, or approved equal.
- B. Connected System Interface.
 - 1. Interface shall be accessible via free operational software package and/or onboard web GUI. Connections shall utilize HTTPS (industry-standard certificate based encryption).
 - 2. Interface shall allow for daily, weekly, monthly, and calendar scheduling of events via time-of-day, photocontrol, and astronomical clocks.
 - 3. The system shall allow users to monitor, control, and make adjustments to all connected devices. It shall provide real time energy usage data.
 - 4. The system shall supervise all connected devices, and provide real time alarms for System faults. Alarms shall include context-sensitive troubleshooting tips.
 - 5. The system shall include a gateway to integrate with BACnet protocol building automation systems.
 - a. BACnet integrator shall be able to monitor, adjust, and control all devices similar to lighting network.
 - b. BACnet integrator shall be able to obtain lighting system energy usage data.

2.3 SEQUENCE OF OPERATIONS

- A. The following descriptions are intended to provide a baseline operational platform for the system. All specific operating points shall be verified with the end user. If not acceptable to the end user, alternative points shall be offered and approved by the Engineer.
 - 1. Large Meeting Rooms and Shared Office Space:
 - a. Individual zone raise/lower as indicated on drawings
 - b. Occupancy Sensors shall operate in Vacancy Mode (switch on, auto off) after 20 minutes.
 - c. Daylight Harvesting override for all luminaires along the exterior row.
 - 2. Individual Office:
 - a. Occupancy Sensors shall operate in Occupancy Mode (auto on, auto off) after 30 minutes.
 - 3. Corridors
 - a. Schedule as directly by owner.
 - b. Wall switches deactivated during scheduled "on" time.
 - c. Off sweep every 2 hours of scheduled "off" time.
 - 4. Courtroom
 - a. Individual zone raise/lower as indicated on drawings.
 - b. Occupancy Sensors shall operate in Occupancy Mode (auto on, auto off) after 30 minutes.

PART 3 – EXECUTION

3.1 STORAGE

- A. Store Lighting Control Components in a cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Install where shown on Drawings, plumb and level.
 2. Top of trim 6'-3" above finished floor for wall-mounted panel.
 3. Conductors neatly dressed and banded with nylon cable ties.
 4. From each flush installation, stub three additional 3/4" conduits into nearest accessible ceiling space to provide for future utilization of spare circuits.
 5. Provide 3/4" plywood backing for all surface-mounted panels.
 6. Provide individual terminal or lug for each wire. Multiple wires to common terminal or several terminals for single stranded conductor not acceptable.
- B. Provide low voltage cabling from control panel to peripheral devices as per manufacturer's instructions. Provide raceway system where concealed in walls, in mechanical rooms, and rooms without accessible ceilings. Cable shall be plenum-rated where installed above accessible ceilings and not in raceway.
 - C. Provide engraved identification nameplate for system cabinet as per Specification 260553.
 - D. Provide control station identification as per Drawings.

3.3 TESTS

- A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative. The commissioning agent shall configure the system as per the sequence of operation, make any adjustments/additions to the configuration as required or instructed, and verify the complete operation of the entire system.
 1. Electrical contractor shall notify owner and engineer twenty one (21) working days in advance to scheduling system commissioning.
- B. Furnish a letter of verification to Engineer indicating that the system has been tested and configured by manufacturer's representative and is found to be complete and functional. List date of test and name of manufacturer's representative. Testing to include a functional test of all devices and verification of proper configuration for all devices. Notify Owner and Engineer one week in advance of scheduled tests.
- C. As part of the required project close out Record Manuals, provide documentation on the commissioning of the system including room by room description indicating:
 1. Sensor parameters, time delays, sensitivities and daylighting setpoints.
 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc).
 3. Load parameters (e.g. blink warning, etc).

3.4 INSTRUCTIONS

- A. After system commissioning is complete, the commissioning agent shall provide the Owner with complete instructions as to proper operation and maintenance of the lighting control system.
- B. Record instructions and include with manual in accordance with Section 260500.

3.5 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 26 2726 – WIRING DEVICES AND DEVICE PLATES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide wiring devices complete with device plates of matching or specified color. Wiring devices include receptacles for the connection of portable equipment and switches used for the control of both lighting and fractional horsepower motor loads. Also included are dimmers, occupancy sensors, photoelectric switches and time switches.

B. Work Installed But Furnished by Others

1. Where indicated, install devices furnished by other Divisions of this Specification.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.

B. Record Manuals

1. Provide information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying the equipment.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Device color: Gray or as selected by Architect. Verify with Architect. (Exception: Red devices on emergency circuits where applicable).
- B. All devices shall be of the same manufacturer, except where specifically noted otherwise with the phrase "NO SUBSTITUTION".

2.2 SWITCHES

A. AC Toggle and Keyed Switches

1. 20-ampere 120/277 volt AC and HP rated.
2. Industrial Grade.
3. Color coded face or body by amperage.
4. Screw pressure plate back wire and side wire.
5. Federal Spec WS-896 listed.
6. Acceptable Manufacturers:
 - a. Cooper 2220 series
 - b. Hubbell 1220 series

- c. Leviton
- d. Pass & Seymour

1220 series
PS20AC series

B. Pilot Light Switches

- 1. Neon lamp in red toggle handle, lit in "on" position.
- 2. 20 ampere, 120/277 volt AC rated.
- 3. Manufacturer: As listed above.

C. Time Switches

- 1. Two Circuit SPST switching, voltage rating as required.
- 2. Digital display with 7-Day programming.
- 3. Non-volatile program memory (battery backup unacceptable).
- 4. Manufacturer: Intermatic #ET2725 series.
- 5. Other acceptable manufacturer: Tork.
- 6. Special units as shown on Drawings.

D. Remote Photoelectric Switches

- 1. Threaded swivel mounting with locking nut and neoprene gasket.
- 2. Light level adjustment slide.
- 3. Activation: 1-5 footcandle on, 3-15 footcandle off.
- 4. Manufacturer: Intermatic #K4200 series, wattage and voltage as required.
- 5. Other acceptable manufacturers: Paragon, Area Lighting Research, Precision, or Tork.

E. Spring Wound Timer Switch

- 1. As shown on Drawings.
- 2. Manufacturer: Intermatic.
- 3. Other acceptable manufacturers: Area Lighting Research, Rhodes Mark Time, or Tork.

F. Occupancy Sensors

- 1. Ceiling Mount – Line Voltage
 - a. Self-contained line voltage unit with no external relays or power packs required.
 - b. Passive dual technology sensing combining passive infrared and ultrasonic/microphonic technology. Selective for initial and maintained triggering.
 - c. Rating: 120 VAC @ 800 watts, 277 VAC @ 1200 watts, electronic ballast rating. No minimum load requirements.
 - d. Ceiling-mount with 360° conical pattern coverage.
 - e. Adjustable time delay, from 5 to 20 minutes.
 - f. Automatic adjustment option for continuous time of day usage monitoring with automatic off delay adjustment.
 - g. Integral light level sensor to prevent turning lights on at selected light level between 10 and 300 footcandles.
 - h. LED activity Indicator.
 - i. Manufacturer: WattStopper #DT-355, Sensorswitch CMR-PDT series, Leviton ODC series, Hubbell OMNIDT-BP series, or approved equal.
- 2. Wall Mount
 - a. Self-contained line voltage unit with passive infrared sensing.

- b. Rating: 120 VAC @ 800 watts, 240/277 VAC @ 1200 watts, electronic ballast rating. No minimum load requirements
 - c. PIR collector beams view out horizontally 35 feet in a wall-to-wall pattern, with a 20-foot effectiveness for small hand or body motions.
 - d. Adjustable time delay, from 5 to 20 minutes, with "OFF" override switch.
 - e. Automatic adjustment option for continuous time of day usage monitoring with automatic off delay adjustment.
 - f. Bypass mode to allow override button to act as a standard on-off switch in case of sensor failure.
 - g. Vandal resistant lens.
 - h. LED activity Indicator.
 - i. Multi-way version:
 - 1) Simultaneous load control from up to four device locations.
 - j. Dual-level version (ab switching):
 - 1) Two separate relays with dual override switches.
 - 2) Independent Auto or Manual mode per relay.
 - k. Manufacturer: WattStopper PW series, Sensorswitch WSX series, Leviton OSSMT series, Hubbell LHIR series, or approved equal.
3. Wall Mount with 0-10V Dimming
- a. Self-contained line voltage unit with passive infrared sensing.
 - b. Rating: 120 VAC @ 800 watts, 240/277 VAC @ 1200 watts. No minimum load requirements.
 - c. Class 1 control of 0-10 Volt LED dimming for full range dimming control.
 - d. PIR collector beams view out horizontally 35 feet in a wall-to-wall pattern, with a 20-foot effectiveness for small hand or body motions.
 - e. Adjustable time delay, up to 30 minutes, with "OFF" override switch.
 - f. Multi-location capable.
 - g. Manufacturer: WattStopper PW-311, Sensorswitch WSX-D, Hubbell LHD-IRS series, or approved equal.

2.3 RECEPTACLES

A. General Purpose

- 1. 20 ampere, self-grounding, NEMA 5-20R, industrial specification grade.
- 2. Nylon face with finder grooves and compact body.
- 3. Minimum 0.032" triple wipe brass contacts.
- 4. Corrosion resistant steel strap interlocked with face and body.
- 5. Screw pressure plate back wire and side wire.
- 6. Federal Spec WC-596 listed.
- 7. Acceptable Manufacturers:

a. Cooper	5362
b. Hubbell	5362
c. Leviton	5362
d. Pass & Seymour	CRB5362

B. Tamper Resistant

- 1. 20 ampere, self-grounding, NEMA 5-20R.
- 2. Energized only when two blade or three blade grounding cord cap is properly inserted.
- 3. Use in all locations indicated in Part 406.12 of the National Electric Code.
- 4. Acceptable Manufacturers:

a. Cooper	TRBR20

b.	Hubbell	CR20TR
c.	Leviton	CR20TR
d.	Pass & Seymour	TR20

C. GFCI

1. 20 ampere, feed-through type.
2. Two utilization points per device, with vertical orientation.
3. Use Tamper Resistant version in all locations indicated in Part 406.12 of the National Electric Code
4. Manufacturer: As listed above.

D. Combination Duplex and USB Charging

1. 20 ampere, Decora style.
2. Two utilization points per device, with vertical orientation.
 - a. Includes one USB-A port.
 - b. Includes one USB-C port.
3. 5 ampere, 5 Volt USB output.
4. Tamper resistant style in all locations indicated in Part 403.12 of the National Electric Code.
5. Manufacturers:

a. Cooper	TRUSBAC20
b. Hubbell	USB20AC5
c. Leviton	T5833
d. Pass & Seymour	TR20USBAC.

E. Damp & Wet Locations

1. All 15 and 20 ampere, 125 and 250 volt non-locking receptacles shall be listed weather-resistant type as per NEC 406.9(A) and 406.9(B)(1).
2. Manufacturer: As listed above.

2.4 DIMMERS

A. Incandescent

1. Phase-selectable for Incandescent, Electronic Low Voltage, and Magnetic Low Voltage.
2. Low end trim adjustment.
3. 500 Watt max load incandescent and low voltage.
4. Manufacturer: Lutron Maestro PRO.
 - a. Multi location dimming capability with Lutron #MA-R devices.

B. LED

1. Control of 0-10 Volt LED dimming for full range dimming control.
2. Wattage as required by luminaire count in room.
3. Integral power pack for positive off.
4. Provide separate power pack if required by total room wattage.
5. Manufacturer: Lutron Diva Series #DVSTV.

2.5 DEVICE PLATES

A. Flush Interior

1. Opening for device intended.
2. 430 or 302/304 stainless steel, or as selected by Architect.
3. Where plastic plates are selected by Architect, provide thermoplastic type.
4. Manufacturer: Cooper, Hubbell, Leviton and Pass & Seymour.

B. Surface Interior

1. 1/2" raised cover

C. Damp & Wet Locations

1. Damp locations:
 - a. Refer to NEC 406.9(A).
 - b. Die-cast aluminum construction with stainless steel springs.
 - c. Unless indicated otherwise on the Drawings, Manufacturer: Pass & Seymour #4500 series or equivalent.
2. Wet locations:
 - a. Refer to NEC 406.9(B).
 - b. Unless indicated otherwise on the Drawings, Manufacturer: Red Dot #CKMU (horizontal) or #CKMUV (vertical), or approved equal by Hubbell.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General

1. Install device and plates where shown on Drawings in accordance with Code, product listing and manufacturer's recommendations.
2. Refer to Section 260534-3.1C for mounting heights.
3. Plumb and level.
4. Tight to wall.
5. Thoroughly cover wall opening around device.
6. Replace all devices and plates that become discolored or burned during construction.
7. Provide blank plates for unused openings.
8. Connect wiring devices by means of single conductor tails. Multiple wire connections not acceptable.
9. Tighten unused connection screws.

B. Identification

1. Identify wall switches which control lighting or equipment not in sight.
2. Refer to Section 260553-3.1C.

C. Receptacles

1. Vertical mounting with grounding pole at bottom.

2. Provide GFCI receptacles at NEC 210.8 locations.

D. Dimmers

1. No common neutrals.
2. Individually mounted: No gang mounting.
3. Do not remove any fins.

E. Photoelectric Switches

1. Install on roof, in center of structure where viewing from ground is minimal.
2. Verify exact location with Architect.
3. Penetrate roof with 3/4" RGSC, securely fastened to structure.
4. Provide flashing to maintain roof integrity.
5. Mount 18" above finished roof surface.
6. Make connections in weatherproof junction box.

F. Occupancy Sensors

1. Provide adequate supports to any structures, ceilings and grid system to safely attach sensors.
2. Mount external power packs (required only for low voltage sensors) within junction box in accessible ceiling space.
3. Verify operating parameters with Engineer.

3.2 TESTS

- A. Proper operation of lighting switches, dimmers and occupancy sensors.

B. Duplex Receptacles

1. Proper connections.
2. Test all receptacles with NRTL listed receptacle circuit tester similar to Bryant #5266-PT, or Ideal #EZ Check.

3.3 INSTRUCTIONS

- A. Instruct Owner's personnel in proper operation, setting, and maintenance of time switches, dimmers, occupancy sensors, and GFCI receptacles.

END OF SECTION

SECTION 26 2813 - FUSES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide all fuses as required.

B. Work Furnished But Not Installed

1. Provide spare fuses for all sizes and classes required.
2. Quantity: 10%, with a minimum of three each rating, including motor starter control transformer fusing.

1.2 SUBMITTALS

A. Record Drawings

1. Indicate actual class, type and size of fuse installed in each device.

B. Record Manuals

1. Submit information in accordance with Section 260500.

PART 2 – PRODUCTS

2.1 FUSES

A. 600 Amperes and Less Protecting Feeders or Combination Motor/Branch Circuit Loads.

1. UL-listed, Class RK-1.
2. Manufacturer: Bussmann LPN-RK/LPS-RK, Littelfuse LLN-RK/LLS-RK, or Brush LEN-R/LES-R.

B. Motor Starter Control Transformers

1. As recommended by manufacturer.

C. Plug Fuses

1. Dual element, UL-listed Type S with adapter.
2. Use only as indicated on Drawings for fused toggle switches.

PART 3 – EXECUTION

3.1 STORAGE

- A. Store fuses in a cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Install fuses in accordance with Code, product listing and manufacturer's recommendations.
2. Verify equipment fuse sized for load prior to installation.
3. All fuses shall be of same manufacturer.
4. Do not mix fuse classes in individual applications.
5. Fuses are not required for switchboard devices marked "Spare".

B. Spare Fuse Cabinet

1. Top of trim 6'-3" above finished floor.
2. Provide ¾" plywood backing.

C. Identification

1. Indicate on inside cover with pressure sensitive tape the size, voltage and type of fuse furnished for each device.

END OF SECTION

SECTION 26 2816 – ENCLOSED SWITCHES & CIRCUIT BREAKERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide disconnects where shown on Drawings or required by Code.
2. Provide enclosed circuit breaker where shown on the Drawings.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Indicate on submittal exact motor or equipment served.
3. Show all details including electrical ratings, enclosure dimensions and other pertinent data.

B. Record Manuals

1. Submit information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying the equipment.

PART 2 – PRODUCTS

2.1 DISCONNECT SWITCHES

A. Switch Interior

1. Positive "off" position.
2. Lugs: NRTL-listed for aluminum and copper cable.
3. Plated current carrying parts.

B. Switch Mechanism

1. Quick-make, quick-break operating handle and mechanism.
2. Integral part of box.
3. Enclosures: Code gauge sheet steel (NEMA 1) or Code gauge galvanized steel (NEMA 3R).
4. Treat with rust-inhibiting phosphate primer.
5. Finish: Baked enamel.

C. Ratings

1. 250 or 600 volt.
2. Heavy duty.
3. Horsepower rated.
4. NRTL-listed "Suitable for Use as Service Equipment" when required.

- D. Fusing
 - 1. NRTL-listed rejection feature.
 - 2. Reject all fuses except UL-listed Class R.
- E. Manufacturer: Panelboard manufacturer.

2.2 ENCLOSED CIRCUIT BREAKERS

- A. Breaker Types:
 - 1. Under 400 ampere: Quick-make, quick-break, thermal magnetic unless otherwise indicated.
 - 2. 400 ampere and over: Solid-state molded case circuit breakers:
 - a. Breakers shall contain electronic sensing, timing and tripping circuits.
 - 1) Long time current
 - a) Adjustable current pickup
 - b) Adjustable time delay
 - 2) Short time current
 - a) Adjustable current pickup
 - b) Adjustable time delay
 - 3) Instantaneous current
 - a) Adjustable current pickup
 - 4) Ground fault
 - a) Where required by the NEC unless otherwise indicated
 - b) Adjustable current pickup
 - c) Adjustable time delay
 - b. Include maintenance-mode override switch with indicating light for
 - 1) Devices serving as Service Disconnect.
 - 2) Devices serving as Main Disconnect of separately derived systems.
 - 3) 1200 Amp frame and larger..
 - 3. Trip indicating.
 - 4. Minimum SCCR rating:
 - a. 10,000 for systems up to 240 volts.
 - b. 35,000 for 277/480 volt systems.
- B. Manufacturer: Panelboard manufacturer.

2.3 PLYWOOD BACKING FOR SURFACE MOUNTED SWITCHES

- A. For interior locations, mount on 3/4" AD, fire-resistant, painted gray (including edges).

PART 3 – EXECUTION

3.1 STORAGE

- A. Store disconnect switches or enclosed circuit breakers in a cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Install all required disconnect switches or enclosed circuit breakers in accordance with Code, product listing and manufacturer's recommendations.
2. Plumb and level.
3. Tighten lugs in accordance with manufacturer's recommendations.

B. Identification

1. Identify disconnect switches or enclosed circuit breakers in accordance with Section 260553.
2. Nameplate required for all disconnect switches. Nameplate to include load served, voltage, horsepower or MCA rating, and fuse size. Nameplate to be installed inside of cover on exterior disconnect switches.

Example:

RT-1
480 Volt, 3 Ø
35 MCA, 40 A Fuses

3. Do not use schedule number, but indicate load served.
4. Pressure sensitive tape identification for disconnect switches containing fuses.
5. Voltage markers on all disconnect switches containing system voltages in excess of 250 volts to ground.

3.3 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 26 2913 – MOTOR STARTERS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide motor starters where shown and scheduled, or as required by Code.

B. Work Installed But Furnished Under Other Directives

1. Refer to Section 260500, Article 1.1, Paragraph D for extent of control devices furnished in other Divisions.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Show all details including electrical ratings, controls, schematic wiring diagrams, enclosure dimensions and other pertinent data.
3. Indicate on submittal exact motor or equipment served.

B. Record Manuals

1. Submit information in accordance with Section 260500.
2. Include installation and maintenance instructions accompanying the equipment.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Product of same manufacturer.
- B. Sizing based upon Eaton equipment.
- C. Other acceptable manufacturers: Approved equal units by Allen Bradley, Schneider, and Siemens.
- D. Contractor is cautioned to verify all physical dimensions of "equal" units prior to accepting quotation for Bid.

2.2 SINGLE PHASE MOTORS WITH INTEGRAL OVERLOAD PROTECTION

- A. Horsepower rated toggle switch, pilot handle where not in sight from motor.

2.3 SINGLE PHASE MOTORS WITHOUT INTEGRAL OVERLOAD PROTECTION

- A. Manual Motor Starter

1. Manually operated toggle switch with integral overload protection.
2. Rendered inoperative unless thermal unit is in position.
3. Provide pilot light for manual starters not in sight from motor.
4. Provide flush-mounted starters with stainless steel plates.
5. NEMA 1 enclosures for surface-mounted starters unless otherwise required by environment.

B. Fused Toggle Switch

1. 4" square box mounting.
2. Complete with fuse adapter and plug fuse of correct rating.
3. Manufacturer: Bussmann or Reliance.
4. **Use only where specifically shown.**

2.4 THREE PHASE AND SPECIFIED SINGLE PHASE MOTORS

A. Across-the-line

1. Magnetic type, non-reversing unless otherwise scheduled.
2. Rated in accordance with NEMA standards, sizes and horsepower ratings.
3. Provide combination fusible unit with Class R fuse holders, where disconnect and starter are shown at the same location.
4. Minimum size: NEMA size 0.
5. Manufacturer's series: Eaton Freedom series, or approved equal units by Allen Bradley 512 series, Schneider 8538 series or Siemens Class 17 series.
6. Control
 - a. 120 volt control transformer
 - b. Control fusing:
 - 1) 250 volt - in accordance with NEC.
 - 2) 600 volt - primary and secondary fusing regardless of VA rating of control transformer.
 - c. Cover-mounted devices for single-speed starters:
 - 1) Transformer operated LED green pilot light for running indication, with push-to-test feature.
 - 2) H-O-A selector switch, unless otherwise scheduled.
 - d. Cover-mounted devices for two-speed starters:
 - 1) Transformer operated LED pilot lights for running indication, with push-to-test feature: Green for low speed, amber for high speed).
 - 2) High-low-off-auto selector switch, unless otherwise scheduled.
 - e. Molded coil construction.
7. Overload Protection – exterior locations
 - a. Resettable overload protection on all phases.
 - b. Class 20 construction.
 - c. Starter inoperative if one or more overload units removed.
8. Overload Protection – interior locations
 - a. Self-powered.
 - b. Solid state construction with adjustable overload protection on all phases.
 - c. Manual reset with capability for remote reset function.
 - d. Phase loss protection.

- e. Ambient-insensitive within operating range of -25°C to 55°C.
 - f. Solid state construction, Class 20.
 - g. Starter inoperative if overload unit is removed.
- 9. Electrical Interlocks
 - a. Space for minimum three, any arrangement NO or NC.
 - b. Quantity: Two NO per starter.
- B. Solid State Starters
 - 1. Control and interlock options as previously indicated.
 - 2. Run bypass contactor.
 - 3. Class 20 overload protection.
 - 4. Heavy-duty rating.
 - 5. Temperature: NRTL-listed for -30 to 50°C ambient.
 - 6. Rated for 4 starts per hour
 - 7. Adjustable ramp times, torque control, and kick start.
 - 8. Solid state reduced voltage type: Eaton 801+ Series.
 - 9. Other acceptable manufacturers: As previously indicated.
- C. Variable Frequency Drive
 - 1. Normal duty packaged combination unit, non-bypass type in fan/filter cooled NEMA 1 enclosure.
 - 2. Integral disconnect shall be Fused switch type. 100K AIC Rated.
 - 3. Full numeric operator keypad with LCD display interface mounted on dead front cover.
 - 4. Hand-Off-Auto selector switch.
 - 5. Transformer operated LED amber pilot light for fault indication, with push-to-test feature
 - 6. Integral 3% Line reactor.
 - 7. Variable Torque.
 - 8. Selectable switching frequency.
 - a. 2kHz to 12k Hz
 - b. Automatic reduction under excessive heat sink temperatures.
 - 9. Minimum I/O
 - a. 5 Digital Inputs
 - b. 2 Analog Inputs
 - c. 2 NO/NC Relay Outputs
 - d. 1 Analog Output
 - 10. Communications protocol
 - a. Ethernet/IP, Modbus, BACnet.
 - 11. Manufacturer: Eaton PowerXL DG1 Series, Allen Bradley Powerflex 753 Series or Schneider Altivar 61 Series.

2.5 THREE PHASE POWER MONITOR

- A. Provide for all three phase motors larger than two horsepower, and all three phase compressor equipment.
 - 1. Not required for motors served by solid state starters or variable frequency drives.
- B. Line voltage to match system.

C. Operating parameters:

1. Trip: 90% rated voltage on any or all phases.
2. Reset: 93% rated voltage on all three phases.
3. Dead band between trip and reset: 3%.
4. Repeat accuracy: 1% maximum at 0-70°C.
5. Trip Delay Time: Two seconds.
6. Reset: Two seconds.
7. Output contact rating: Pilot Duty, 470 VA @ 600 VAC.
8. Transient Protection: 2500 Volts for 10 MS.

D. Special Options

1. NEMA 1 or 3R enclosure as required.
2. Adjustable Time Delayed Restart: 30-300 seconds. Set at 300 seconds.

E. Manufacturer: Motor Saver Model 350.

F. Other acceptable manufacturers: Eaton #D65 series.

2.6 PLYWOOD BACKING FOR SURFACE MOUNTED STARTERS

- A. 3/4" grade AD, fire-resistant, painted gray (including edges).

PART 3 – EXECUTION

3.1 STORAGE

- A. Store motor starters in cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Plumb and level.
2. Install motor starters in accordance with Code, product listing and manufacturer's recommendations.
3. Tighten all lugs in accordance with manufacturer's recommendations.
4. Verify correct size overload protection with motor nameplate data and manufacturer's recommendations.
5. Where power factor correction is specified for connection to motor terminals (i.e. load side of overload units), reduce overload rating as per manufacturer's recommendations.
6. Provide 3/4" plywood backing where several controls are shown grouped for surface mounting.

B. Identification

1. Identify motor starters in accordance with Section 260553.
2. Provide two nameplates for all motor starters: One for starter, other for equipment. Do not mount equipment nameplate on motor. Rather, mount on equipment, in visible location near motor.
3. Do not use motor schedule numbers, but indicate motor or load served.

4. Provide pressure-sensitive tape identification in accordance with Section 260553 and 262813 for all motor starters containing fuses.
5. Indicate proper thermal overload unit by circling correct number on chart affixed to cover of starter.
6. Provide voltage markers for all motor starters containing a system voltage in excess of 250 volts to ground.
7. Voltage markers not required for motor starters which form a part of a motor control center as specified in Section 262419.

3.3 TESTS

- A. Proper operation.
- B. Correct rotation.
- C. Solid state motor starters
 1. Furnish letter of verification to Engineer indicating solid state motor starters have been tested by manufacturer's representative.
 2. List date of test and name of manufacturer's representative.

3.4 INSTRUCTIONS

- A. Manufacturer's representative shall instruct Owner in proper maintenance and testing of solid state motor starters. Include name of Owner's representative in letter of verification.
- B. Record instructions and include with Record Manuals in accordance with Section 260500.

3.5 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 26 5100 - LUMINAIRES

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Furnish and install a complete luminaire for each lighting outlet.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500 including voltage, housing and door frame material, lens type, diffuser thickness, lumen output, and color temperature.

B. Record Manuals

1. Provide information in accordance with Section 260500.

1.3 COORDINATION

- A. Confirm compatibility and interface of luminaire with other materials and job conditions prior to ordering. Report discrepancies to Engineer and defer ordering until clarified.
- B. Provide frames, trim rings, and backboxes as required.
- C. Coordinate with work of all other Divisions to avoid conflicts between luminaires, supports, fittings and mechanical equipment. Ceiling clearances are minimal. It is imperative that Contractors coordinate conduit and duct runs to facilitate luminaire installation as shown on reflected ceiling plans. Engineer will not be responsible for interferences arising from lack of field coordination between trades.

PART 2 – PRODUCTS

2.1 LUMINAIRES

A. General

1. UL or other NRTL listed.
2. Where shown to be installed in fire-rated assemblies, luminaires shall be listed in accordance with UL Standard 1598. Supplemental penetration protection (tenting) will be accomplished by General Contractor in accordance with UL Fire Resistance Directory. Coordinate installation with General Contractor. Supplemental protection shall be spaced minimum 1/2" away from the luminaire, per UL Standard 1598.
3. Verify ceiling finishes and equip all recessed luminaires with appropriate frames as required.
4. Furnish luminaires intended for use in lay-in grid ceilings with proper clips for compliance with NEC.
5. Refer to Section 260500 for "Prior Approval to Quote" procedure.

B. LED Lighting Systems

1. General: All LED lighting system components must be UL or other NRTL listed.
2. Light Engines:
 - a. Meets or exceeds 70% lumen maintenance at 50,000 hours based on IESNA LM-79-2008.
 - b. Minimum 80+ CRI rating.
 - c. 4000K color temperature, or as scheduled on drawings.
 - d. Minimum delivered lumens as scheduled on drawings.
3. Electronic drivers for LED's:
 - a. Factory installed.
 - b. Multi-volt for use on either 120v or 277v systems.
 - c. THD: < 20%.
 - d. Factory installed quick-disconnect plug internal to the luminaire for driver removal.
 - e. Rated for a minimum of 50,000 hours.
 - f. 0-10 Volt dimming standard. Provide non-dimming drivers only as scheduled.
 - 1) Controls and wiring as per manufacturer's recommendations. Provide power packs for wall-box dimmers as required for positive luminaire off.
4. Downlights shall incorporate integral diffuser type lens. Exposed modules not acceptable.
5. Emergency battery packs:
 - a. Include self-testing/self-diagnostics with audible alarm option.
 - b. Factory installed.
 - c. Minimum lumens as scheduled.
6. Spare Drivers:
 - a. Luminaire manufacturer shall keep reasonable driver stocks on hand for replacement of defective drivers under guarantee period.
7. Guarantee period: Minimum 60 months from date of substantial project completion.
 - a. Guarantee shall include all parts and labor required to bring luminaire to complete operation.
 - b. Labor shall be performed by an Owner approved Electrical Contractor licensed in the area the work is to be performed.
 - c. Any costs for equipment rentals required to service luminaires under warranty shall be the responsibility of luminaire manufacturer.

PART 3 – EXECUTION

3.1 STORAGE

- A. Store luminaires in a cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Install luminaires plumb and true, free of light leaks, warps, dents and other irregularities.
2. Equip any outlets not specifically labeled with a luminaire the same as those in rooms used for similar purposes.
3. Run all directional lenses the same direction in rooms, corridors and other adjacent areas that contain square luminaires.
4. Continuous row luminaires: Hang level in straight line and butt tightly together.

5. Verify exact location of luminaires with reflected ceiling plan. Any discrepancies between the lighting plan, reflected ceiling plan, or installed ceilings shall be brought to the attention of the Engineer for clarification prior to installation.
6. Coordinate with Mechanical Contractor in advance of installation to prevent space conflicts.
7. Connect recessed luminaires to branch circuitry by means of single flexible metal conduit 6'-0" in length.

B. Barriers

1. Required where recessed luminaires are installed in insulated ceilings.
2. Suitable material to satisfy NRTL requirements.
3. Provided by Division 26 when not indicated otherwise.
4. Coordinate installation.

C. Luminaire Supports

1. Provide adequate supports to any structures, ceilings and grid systems to safely suspend or attach luminaires.
2. General Contractor to provide ceiling support systems as required by that portion of the Specifications. Electrical Contractor to provide any additional supports on an "as needed" basis to prevent ceiling from sagging or developing other irregularities.
3. Contractor responsible for providing proper suspension and mounting devices and to safely support all luminaires shown on Drawings, regardless of ceiling systems.
4. Rigidly support surface suspended ceiling system with anchors, hangers or clips designed for the purpose.
5. Support surface-mounted luminaires at four-foot intervals.
6. Install recessed luminaires in accordance with manufacturer's recommendations.
7. Rigidly support recessed luminaires to structural members or properly supported ceiling system with hangers, clips or fasteners designed for the purpose.
8. Support pendant and stem-hung luminaires at four-foot intervals.

D. 0 – 10 Volt Dimming Control Circuits

1. Installed in accordance with NEC Article 725.
2. Class 1 systems
 - a. #14 AWG THWN/THHN solid conductors installed in the same raceway as associated power wiring.
3. Class 2 systems
 - a. #18/2 non-shielded cable unless otherwise indicated on the drawings.
 - b. Plenum rated where required.
 - c. Cable shall be installed in raceway when concealed within walls, in mechanical rooms, and rooms without ceilings.
 - 1) DO NOT INSTALL IN SAME RACEWAY AS POWER CIRCUITRY.
 - d. Cable not required to be enclosed in raceway when installed above accessible ceilings.
 - 1) Route cables parallel or perpendicular to building construction.
 - 2) Support cables from building structure utilizing approved methods.
 - 3) Neatly coil excess cable length of pre-terminated assemblies.
 - 4) All cable runs shall be continuous between devices. NO SPLICING.

3.3 TESTS

- A. Upon completion of this portion of the Work and prior to its acceptance by Owner, check for proper alignment and operation of all lighting equipment.

3.4 CLEAN UP

- A. Clean all luminaires immediately prior to final inspection.

END OF SECTION

SECTION 27 0500 – DIVISION 27 GENERAL PROVISIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The provisions and requirements of Section 260500 shall be applicable to Division 27.
- B. All Division 27 work shall be included under the Division 26 contract.
- C. The Contractor shall take special note that any conflicts between the Contractor and any Division 27 subcontractors shall not become an issue of the Engineer or Owner. It shall be the Contractor's responsibility to coordinate with the Division 27 subcontractor/s to determine where their work leaves off and where the subcontractor's work begins. The Contractor shall be responsible for all specified work including the operations of work under Division 27.

END OF SECTION

SECTION 27 0528 – NETWORK SYSTEMS ROUGH-IN

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide raceways for network systems as shown on the Drawings.

B. Work furnished and installed by others.

1. Local serving telephone utility shall place the service entrance cable to the point of presence, install circuit protection cabinet, protectors, and ground the entrance cable as needed to the service grounding conductor provided under this contract.
2. Owner's network systems supplier shall provide all network cables, devices, faceplates, terminations, data racks, end-user software, programming, computer servers, terminals and personal computers.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Main telephone terminal boards (TTB):** ¾" grade AD fire-resistant plywood, painted gray (including edges). Dimensions as required by serving utility company.

B. Voice/data terminal board (TTB):

1. ¾" grade AD fire-resistant plywood, painted gray (including edges). Dimension as required by Owner's network system supplier. May be included with main telephone terminal board for single board installation.

C. Raceways:

1. As specified in Section 260533 and sized as shown on Drawings, minimum 3/4".

D. Boxes:

1. 2-1/8" deep unless restricted by wall thickness.
2. As specified in Section 260534 and 260540.

E. Blank plates:

1. As specified in Section 262726, yoke-mounted. Box-mounted plates not acceptable.

F. Firestop Assemblies

1. NRTL listed 4" square pathway with intumescent material designed to seal out fire, smoke, and toxic gases.

2. Quantity shall equal or exceed the width of the associated cable tray. i.e. a 6" wide tray requires two pathways.
3. Include mounting accessories as required by application specifics.
4. Manufacturer: EZ Path Series 44, 3M Model PT4SD or approved equal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Serving Communications Utility Requirements

1. Raceways:
 - a. Provide telephone service entrance conduit, stubbed to terminal board from property line.
 - b. Verify service entrance conduit size and quantity, and property line location with serving utility.
 - c. Provide bushing or connector at each conduit stub.
 - d. Provide pull wire in each telephone conduit run.
2. Provide surface double-duplex receptacle at main telephone terminal board, fed from dedicated spare circuit breaker. Receptacles to be isolated ground type, with separate grounding conductor connected to panelboard grounding bar.
3. Provide telephone board communication grounding bus as required by serving utility, minimum #6 solid SDBC in conduit, extended shortest and most direct route to ground bar at main switch. Terminate in ground bar affixed to telephone terminal board, location as directed by serving utility.
4. Entire installation to comply with serving utility company requirements.

B. Raceways:

1. Stub from rough-in location into nearest accessible ceiling space, or location as indicated on Drawings.
2. Stub from rough-in location to within 6" of nearest cable tray, or location as indicated on drawings.
3. Provide bushing or connector at each conduit stub.
4. Provide pull wire in each voice/data raceway.
5. Provide raceway system where concealed in walls, in mechanical rooms and rooms without accessible ceilings.

C. Provide blank plates for all rough-in boxes not concealed by Owner's voice/data equipment.

D. Entire installation to comply with Owner's network systems supplier requirements.

END OF SECTION

SECTION 27 1513 – NETWORK CABLING

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide Network Cabling System as shown and described.

B. Work furnished and installed by others.

1. Voice: The Owner will provide all telephone handsets.
2. Data: The Owner will provide all end-user software, programming, computer servers, terminals and personal computers.
3. Surveillance: The surveillance system cameras, servers, switches and storage equipment will be provided and installed either by the Owner or under other Sections of this specification.

C. Description of System

1. Voice: Work shall include, but not be limited to, devices, faceplates, cables and cable assemblies, connecting blocks, cable management, terminations, and final acceptance testing.
2. Data: Work shall include, but not be limited to, devices, faceplates, cables and cable assemblies, cable management, patch panels, data racks, terminations, and testing.
3. Surveillance: Work shall include, but not be limited to, devices, cables and cable assemblies, cable management, patch panels, data racks, terminations, and testing.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Indicate:
 - a. Mounting details.
 - b. Connection diagrams.
 - c. Description of devices.
 - d. Name of installation Contractor/Subcontractor.

B. Record Manuals

1. Provide information in accordance with Section 260500.
2. Include manufacturer's data for adjustment, operation and maintenance of equipment and name of service organization.

PART 2 – PRODUCTS

2.1 MANUFACTURER/SUPPLIER

- A. The system specified is based on equipment as manufactured by General Cable, Panduit, Commscope and other manufacturers as listed. All reference to model numbers and other pertinent information is intended to establish the standards of operational concepts, performance, quality and appearance which must be met. Backboards, conduit, cable tray, and rough-ins shall be by Electrical Contractor.
- B. Contractors/Subcontractors performing Section 271500 work shall have personnel trained/certified in communications cabling installation via equipment manufacturers' or industry standards' training programs. Refer to Section 260500-1.5 Quality Assurance.
- C. Acceptable installers:
 - 1. Computer Store, 1100 S Broadway, Minot, ND 58701, 701/838-3967.
 - 2. Data Connections, 4016 37th Avenue NW, Mandan, ND 701/426-8771.
 - 3. Dell-Comm, Inc. 812 S 18th St., Bismarck, ND 58504, 701/222-2887.
 - 4. Gefroh Electric, 100 45th Ave NW, Minot, ND 58703, 701/838-0225.
 - 5. Innova Integrated Systems, 1800 22nd Ave SW, Minot, ND, 701/837-0131.
 - 6. Main Electric, 2626 Valley St., Minot, ND 58701, 701/852-3315.
 - 7. Maycomm, 1711 12th Ave SW, Minot, ND 58701, 701/838-8401.
 - 8. Muth Technology, 600 E Benson Rd, Sioux Falls, SD 57104, 800/888-1597.
 - 9. RBB Electric, 1123 N 1st St., Grand Forks, ND 58208, 701/775-7404.
 - 10. Wheeler Construction, 1720 South Broadway, Minot, ND, 58701, 701/852-5584.
 - 11. Installers not listed above and wishing to quote shall refer to Specification 260500-1.4 for approval procedure. No consideration shall be given to any installer not pre-approved.

2.2 DEVICES AND FACEPLATES

- A. Data jacks: Single outlet RJ45, eight-pin/eight wire, modular construction, TIA/EIA-568.2-D Category 6 compliant, T568A and T568B identification, Panduit Mini-Com #CJ688TG, Commscope #MGS400 series, Leviton #61UJK series, or approved equal.
- B. Voice jacks: Same as data jacks.
- C. Voice wall-mount face plate/jack assembly: Stainless steel with Category 6 keystone jack, Panduit #KWP6, Commscope #630B8, Leviton #4108W1SP series, or approved equal.
- D. Faceplates
 - 1. Single gang with ID windows and two or four modular inserts as dictated by jack count shown on the drawings.
 - 2. 430 or 302/304 stainless steel, or as selected by Architect.
 - a. Panduit #CFPL2/4 series, Commscope #M12/14SP-L series, Leviton #43080-1L2/4 series, or approved equal.
 - 3. Where plastic plates are selected by Architect.
 - a. Panduit #CFPE2/4 series, Commscope #M12/14L series, Leviton #42080-2/4 series, or approved equal.

- E. Provide blank modules as required. Panduit #CMB, Commscope #M81, Leviton #41084 series, or approved equal.
- F. Color: Devices as selected by Owner, faceplates as selected by Architect.
- G. Surveillance Cameras
 - 1. Jack assembly for cameras mounted to accessible ceilings shall utilize Panduit Model #CBXQ1IW- A enclosure mounted to building structure above the ceiling. Surveillance system provider shall be responsible for patchcord between camera and jack.
 - 2. Cameras mounted directly to rough-ins or surface boxes shall utilize cable terminated to RJ45 Plug, Panduit Model #FP6X88MTG field terminating type or approved equal. Provide minimum 12" extra cable length within rough-in or camera mounting equipment.

2.3 CABLES AND CABLE ASSEMBLIES

- A. Station cables (voice and data): Four unshielded, twisted pair, #23 gauge, Category 6 – 350 MHz, solid copper conductor, cable tray and plenum rated.
 - 1. General Cable #7131900, Commscope #2088B, Berk-Tek #10032094 or equivalent meeting the following characteristics at 250 MHz.
 - a. ACR: 10.5 dB min. @ 100m
 - b. PS-ACR: 8.5 dB min. @ 100m
 - c. ELFEXT: 24.5 dB min.
 - d. PS-ELFEXT: 21.5 dB min.
 - e. NEXT: 43 dB min.
 - f. PS-NEXT: 41 dB min.
 - g. ATTEN.: 32.8 dB max. @ 100m
 - h. LCL: 26 dB min.
 - i. Return Loss: 20 dB min.
- B. Extended Range cable: Four unshielded, twisted pair, #22 gauge, Category 6, solid copper conductor, cable tray and plenum rated.
 - 1. Limited power listed for up to 90 Watts (PoE Type 4)
 - 2. Certified for 10 Mbps transmission up to 250 meters.
 - 3. Certified for 1 Gbps transmission up to 200 meters.
 - 4. General Cable #8131800, Paige #258300336, or equivalent meeting the following characteristics at 250 MHz.
 - a. Insertion Loss: 30.6 dB/100m max.
 - b. Return Loss : 17.3 dB/100m min.
 - c. NEXT: 38.3 dB/100m min.
 - d. PSNEXT: 36.3 dB/100m min.
 - 5. Use only where indicated on the Drawings.
- C. Outside Plant cable: Four unshielded, twisted pair, #23 gauge, Category 6, solid copper conductor, gel filled water block for underground/wet applications and UV resistant insulation.
 - 1. General Cable #7136100, Commscope #1572A, Berk-Tek #10139885 or equivalent meeting the following characteristics at 250MHz.

- a. Insertion Loss: 32.8 dB max.
 - b. Return Loss : 17.3 dB min.
 - c. NEXT: 38.3 dB min.
 - d. PSNEXT: 36.3 dB min.
- D. Outside Plant Extended Range cable: Four unshielded, twisted pair, #22 gauge, Category 6, solid copper conductor, gel filled water block, wet listed, and extended range.
 - 1. Limited power listed for up to 90 Watts (PoE Type 4)
 - 2. Certified for 10 Mbps transmission up to 250 meters.
 - 3. Certified for 1 Gbps transmission up to 200 meters.
 - 4. General Cable #8146100, Paige #258330804, or equivalent meeting the following characteristics at 250 MHz.
 - a. Insertion Loss: 30.6 dB/100m max.
 - b. Return Loss : 17.3. dB/100m min.
 - c. NEXT: 38.3 dB/100m min.
 - d. PSNEXT: 36.3 dB/100m min.

2.4 WIRELESS ACCESS POINT (WAP) CABLING

- A. Cabling for WAP's shall be Limited Power Listed CAT 6A.
 - 1. Data jacks: Single outlet RJ45, eight-pin/eight wire, modular construction, TIA/EIA-568.2-D Category 6A compliant, T568A and T568B identification, Panduit Mini-Com #CJ6X88TG, or approved equal.
 - 2. Above Ceiling Installation: Panduit #CBXQ2IW-A, or Approved Equal surface termination box attached to building structure.
 - 3. Station cables: Four unshielded, twisted pair, #23 gauge, Category 6A – 500 MHz, solid copper conductor, cable tray and plenum rated. UL Listed CMP-LP (0.7A).
 - a. General Cable #7151850 or Approved Equal meeting the following characteristics per 100 meters at 500 MHz.
 - 1) ACRF: 13.8 dB min.
 - 2) PSACRF: 10.8 dB min.
 - 3) PSAACRF: 32.0 dB min.
 - 4) NEXT: 33.8 dB min.
 - 5) PSNEXT: 31.8 dB min.
 - 6) PSANEXT: 60.0 dB min.
 - 7) Return Loss: 15.2 dB min.

2.5 MISCELLANEOUS PRODUCTS

- A. Cable management:
 - 1. 6" die-cast aluminum distribution rings: Allen Tel #GB13C or equivalent.
 - 2. Plenum velcro cable ties: Panduit #HLSP series or equivalent.
 - 3. Cable hooks with retainers: B-Line #BCH series or equivalent.

B. Patch Panels

1. Patch panels shall have modular jack-style termination connectors, be 24-port or 48-port in size, one or two standard EIA rack spaces in height. The panels shall have separate port and panel designation strips. Panduit #CP24BL or #CP48BL, Commscope #M2400-1U-GS, Leviton #49255-H24 or #49255-H48, or approved equal.
2. Quantity: As required by station cable count.

C. Data Rack (DTR)

1. 84", floor-mounted, EIA/TIA 19" rack assembly. Panduit #R2P, Hoffman #EDR19FM45U, Chatsworth #55053-X03, or equivalent, quantity as shown on Drawings.
2. Provide horizontal cable management panels with integral bend radius control for front and rear cables. Size and quantity determined by cable and patch panel quantity. Panduit #NCMH2, Hoffman #DCHD2, Chatsworth #13930-702, or equivalent.
3. Provide full height 4"x5" vertical cable management panels for front and rear cables. Panels required on both sides of rack. Panduit #WMPV45E, Hoffman #DV6D7, Chatsworth #13915-703, or equivalent.

D. Identification:

1. Panduit #LS8E or Pan-Mark labeling systems or equivalent. Hand lettering not acceptable.

E. Power Strip:

1. 19" rack-mounted surge suppression strip. Six (6) NEMA 5-20 duplex receptacles. UL1449 listed. Clamping level not to exceed 330 volts.
2. Manufacturer: Leviton #5500-192 or equivalent.
3. Quantity: One per data rack.

2.6 COLOR

- A. All cables shall match their associated jack color for type of system served unless otherwise indicated.
- B. Verify cable and jack color configuration with Engineer/Owner's Rep.
- C. Typical color configuration.
1. Voice Jacks – Match Faceplate (Yellow cable)
 2. Data Jacks – Yellow
 3. WAP – Orange
 4. Cameras – Purple

PART 3 – EXECUTION

3.1 STORAGE

- A. Store system equipment in cool, dry space prior to installation.

3.2 GENERAL

- A. Securely install components where shown on Drawings.

- B. Contractor shall adjust and provide all other assistance required at final inspection to bring the system satisfactorily on-line.
- C. Install in accordance with NEC, EIA/TIA Standards, NRTL listing, and manufacturer's recommendations and instructions.
- D. All cables that extend underground shall be listed for use in wet locations. See Outside Plant cables in Part 2 for requirements.
- E. Cable:
 - 1. Install cables in raceways as required by Section 270528 and in cable tray (communications type) where cable tray is specified.
 - 2. Route open air cables (where not in raceway or cable tray) parallel or perpendicular to building construction supporting with specified products, maximum 4'-0" on center.
 - 3. Bundle multiple open air cable runs located in TTB/TB rooms together with velcro cable ties
 - 4. Identify ends of cables with room designations as directed by Owner.
 - 5. Bending radius shall be minimum 1".
 - 6. All cable runs shall be continuous, **NO SPLICING**.

3.3 DATA

- A. Provide Data Rack(s) as shown and specified.
- B. Install patch panels and cable management system in Data Rack.
- C. Install data station cable from patch panel to data outlet locations as shown on the Drawings. Cable length not to exceed 295 feet.
- D. Terminate cables according to T568A or T568B wiring scheme as determined by Owner's system requirements.
- E. Extended range cable to only be used where indicated on the Drawings, or where approved by the Engineer. Use of this cable is not permitted as an alternative to change or alter network system distribution locations or quantities.
- F. Identify cable at both ends according to Owner's convention. Arrange patch panels and patch panel jacks as per Owner's convention. Identify all patch panels, patch panel jacks, and faceplate jacks according to Owner's convention.
 - 1. If no convention is available, room numbers shall be incorporated into the identification. Ex: For room 120, use 120-1 for first cable, 120-2 for second cable, etc.

3.4 SURVEILLANCE

- A. Install separate dedicated patch panels in Data Rack for the camera cables.
- B. Install station cable from patch panel to camera locations as shown on the Drawings. Cable length not to exceed 295 feet. Verify exact camera location and mounting configuration with Surveillance System installer.

1. Extended range cable to only be used where indicated on the Drawings or where approved by the Engineer.
- C. Terminate cables according to T568A or T568B wiring scheme as determined by Owner's system requirements.
- D. Identify cable at both ends according to Owner's convention. Arrange patch panels and patch panel jacks as per Owner's convention. Identify all patch panels, patch panel jacks, and faceplate jacks according to Owner's convention.
 1. If no convention is available, camera numbers shall be incorporated into the identification. Ex: For camera 21, use C-21.

3.5 GROUNDING

- A. For each data rack, provide one #10 AWG solid copper conductor from data rack to nearest panelboard with equipment ground bus.
- B. Where multiple data racks are located in single room (more than 2), provide isolated communication grounding bus in room. Extend #6 solid SDBC in conduit, extended shortest and most direct route to ground bar at nearest panelboard with equipment ground bus. Extend one #10 AWG solid copper conductor from each data rack to communication grounding bus in room.

3.6 TESTING REQUIREMENTS

- A. All terminated voice and data cables shall be tested and certified for TIA/EIA-568.2-D. Category 6 standards. The test shall be performed on the permanent link configuration (from station jack to patch panel jack). These standards require the following when tested at 250 MHz:
 1. Return Loss shall be no less than 10.0dB.
 2. Insertion Loss (Attenuation) shall not exceed 31.1dB.
 3. Near End Cross Talk (NEXT) shall be no less than 35.3dB.
 4. Power Sum Near End Cross Talk (PSNEXT) shall be no less than 32.7dB.
 5. Attenuation to Crosstalk Ratio Far-end (ACRF) shall be no less than 16.2dB.
 6. Power Sum ACRF (PSACRF) shall be no less than 13.2dB.
 7. Propagation Delay shall be less than 490 nanoseconds.
 8. Propagation Delay Skew shall be less than 44 nanoseconds.
- B. All terminated WAP cables shall be tested and certified for TIA/EIA-568.2-D. Category 6A standards. The test shall be performed on the permanent link configuration (from station jack to patch panel jack). These standards require the following when tested at 500 MHz:
 1. Return Loss shall be no less than 8.0dB.
 2. Insertion Loss (Attenuation) shall not exceed 43.8dB.
 3. Near-end Cross Talk (NEXT) shall be no less than 26.7dB.
 4. Power Sum Near-end Cross Talk (PSNEXT) shall be no less than 23.8dB.
 5. Attenuation to Crosstalk Ratio Far-end (ACRF) shall be no less than 10.2dB.
 6. Power Sum ACRF (PSACRF) shall be no less than 7.2 dB.
 7. Propagation Delay shall be less than 490 nanoseconds.
 8. Propagation Delay Skew shall be less than 44 nanoseconds.
 9. Power Sum Alien Near-end Cross Talk (PSANEXT) shall be no less than 49.5 dB.
 10. Power Sum Alien Attenuation to Crosstalk Ratio Far-end (PSAACRF) shall be no less than 23.7 dB.

- C. Additional testing shall include line mapping and cable length before final acceptance by Owner.
 - 1. DC resistance shall be less than 3% or less than 150 milli-Ohms.
- D. All permanent link cable runs shall be documented with a hard copy print-out of the test results. Compile one copy of test results in a loose-leaf binder, similar to manual references in Section 260500, 1.04E. Submit at project completion with referenced Record Manual.
- E. Field tester to be Level III and conform to TIA/EIA 568.2-D Annex A & B requirements.

3.7 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 27 4116 – MEETING ROOM MULTI-MEDIA SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Provide complete and operational multimedia reinforcement system for the Meeting Room as shown on Drawings.

B. Work furnished and installed by others

1. The Owner will provide PoE network equipment and internet service.

C. Description of System

1. The system shall provide A/V presentation through the provided TV via wired HDMI and wireless program sources.
2. The system shall support virtual meetings via the provided webcam and networked small form factor Mini PC (NUC).

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Indicate mounting details, cabinet dimensions, connection diagrams, and description of system functions.

B. Record Manuals

1. Submit information in accordance with Section 260500.
2. Include manufacturer's data for adjustment, operation and maintenance of equipment and name of service organization.

PART 2 – PRODUCTS

2.1 MANUFACTURER/SUPPLIER

A. The system specified is based on equipment as manufactured Extron and other manufacturers as listed.

B. All references to model numbers and other pertinent information is intended to establish the standards of operational concepts, performance, quality and appearance which must be met.

C. Acceptable suppliers:

1. AVI, 1930 East Century Avenue, Bismarck, North Dakota, (701) 223-3800.
2. The Computer Store, 1100 S Broadway, Minot, North Dakota, (701) 838-3967.

3. TriCorne Audio Inc, 4023 State Street, Bismarck, North Dakota, (701) 258-6912.

2.2 SMART TV (BY OWNER)

- A. 65" Class LED TV
- B. 4K UHD
- C. Minimum 120 Hz or faster refresh rate.
- D. Smart Capable with Integral LAN port.
- E. HDMI inputs as required.
- F. Manufacturers: LG, Samsung, Sharp, Sony, Toshiba, or Vizio.

2.3 VIRTUAL MEETING EQUIPMENT

- A. NUC.
 1. Intel Core i5 Processor with minimum operating speed of 4GHz.
 2. Integral SSD hard drive (250 GB minimum)
 3. 8 GB Memory minimum.
 4. I/O: Ethernet port, HDMI, USB-C.
 5. Windows, Latest Version, 64 bit operating system.
 6. Wireless Keyboard and Mouse with high output USB dongle.
 7. Manufacturer: Lenovo: #TSC2-IP
- B. Webcam.
 1. 4k camera with electronic pan/tilt/zoom with auto frame technology.
 2. Integral full range stereo speakers with DSP.
 3. Integral 27-microphone array.
 4. USB plug and play, compatible with Windows version provided on NUC.
 5. Manufacturer: Biamp Parle #VBC2800 or approved equal.

2.4 PRESENTATION EQUIPMENT

- A. Tabletop Controller.
 1. Allows one touch option to join Microsoft Teams meetings.
 2. Include link box as required.
 3. Include cabling between controller and MTR connector.
 - a. Manufacturer: Lenovo: #12WE000BUS
- B. Tabletop Interface.
 1. Flip-top style flush mount box for power and A/V connections with cable pass through cover.
 2. Internal Devices
 - a. One retractable HDMI
 - b. One retractable White Cat 6 RJ45 (telco)
 - c. One retractable Blue Cat 6 RJ45 (data).
 - d. One Nema 5-15 power receptacle with USB A and C power.
 3. Manufacturer: Extron #CableCubby 500 series or approved equal.

2.5 MISC.

- A. Provide wall mounting brackets for all equipment as required for complete system installation. Ensure TV bracket provides proper clearance for the other equipment.
- B. Provide all HDMI, USB, CAT6, and AUDIO patch cords as required for complete system.

PART 3 – EXECUTION

3.1 STORAGE

- A. Store public address components in a cool, dry space prior to installation.

3.2 INSTALLATION

- A. General
 - 1. Verify exact mounting height/position of TV with Owner prior to installation.
 - 2. Install NUC and Presentation Gateway concealed behind the TV.
 - a. Carefully support all cables to ensure they are properly concealed behind the TV.
 - b. Route Tabletop HDMI through the Presentation Gateway (not connected directly to a TV input).
 - 3. Verify exact mounting location of the Tabletop Interface with Owner prior to installation in meeting room table (provided by others).
 - 4. Obtain required IP addresses for TV, NUC, and Gateway from Owner and perform complete setup of each device.

3.3 TESTS

- A. Prior to final inspection, verify that the multimedia system is in proper working condition. Furnish letter of verification to Engineer indicating that the system has been tested by a manufacturer's representative. List date of test and name of manufacturer's representative. Division 26 contractor responsible for test and scheduling.

3.4 INSTRUCTIONS

- A. Manufacturer's representative shall instruct Owner in proper operation, maintenance and testing of the complete system. Indicate on letter of verification, name of Owner's representative receiving instructions.
- B. Record instructions and include with Record Manuals in accordance with Section 260500.

3.5 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 28 0500 – DIVISION 28 GENERAL PROVISIONS

PART 1 – GENERAL

1.1 DESCRIPTION

- A. The provisions and requirements of Section 260500 shall be applicable to Division 28.
- B. All Division 28 work shall be included under the Division 26 contract.
- C. The Contractor shall take special note that any conflicts between the Contractor and any Division 28 subcontractors shall not become an issue of the Engineer or Owner. It shall be the Contractor's responsibility to coordinate with the Division 28 subcontractor/s to determine where their work leaves off and where the subcontractor's work begins. The Contractor shall be responsible for all specified work including the operations of work under Division 28.

END OF SECTION

SECTION 28 1000 – CONTROLLED ACCESS SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Furnish and install rough-ins and provide raceway and cabling to the suggested controlled access control panels for a complete controlled access system by owners vendor.
2. All work in conjunction with this installation shall meet the provisions of the National Electrical Code and any other applicable codes.

1.2 SUBMITTALS

A. Shop Drawings

1. Provide information in accordance with Section 260500.
2. Indicate:
 - a. Mounting details.
 - b. Wiring diagrams.
 - c. Floor plan layout of devices.

PART 2 – PRODUCTS

2.1 MANUFACTURER/SUPPLIER

- ##### **A.**
- The system specified is based on equipment as manufactured by Keyscan Access Control Systems and Altronix Power Supplies. All references to model numbers and other pertinent information is intended to establish the standards of operational concepts, performance, quality and appearance which must be met.

2.2 CENTRAL SYSTEM

A. Proximity Readers

1. Indoor/Outdoor IP65 rated.
2. Universal proximity and mobile credential compatibility.
3. Wiegand output.
4. Transmitting frequencies: 125 kHz, 13.56 MHz, and 2.4 GHz.
5. Supply Voltage Range 5/16 VDC.
6. Supplied and installed by others.

B. Electric Door Strikes.

1. 24 Volt DC.
2. Supplied and installed by others.

- C. Motorized Electric Latch (panic device)
 - 1. 24 Volt DC.
 - 2. Low Power Version
 - a. 1.0 Amp inrush (0.5 sec)
 - b. 0.15 Amp holding.
 - 3. Power transfer hardware.
 - 4. Supplied and installed by others.
- D. Door Sensors
 - 1. Man-Door Type
 - a. Flush-mount type suitable for steel or wood doors.
 - b. Suitable for supervised inputs.
 - c. Manufacturer: Interlogix Model #1078 Series or equivalent.
 - 2. Overhead-Door Type
 - a. Surface-mount type with 3' armored cable lead.
 - b. Suitable for supervised inputs.
 - c. Include mounting bracket suitable for application.
 - d. Manufacturer: Interlogix Model #2500 Series or equivalent.
- E. Request to Exit Sensor
 - 1. Dual technology wall or ceiling mount motion sensor with adjustable coverage.
 - 2. DPDT contact to shunt door position sensor.
 - 3. Low Voltage (12 – 30 VAC/VDC)
 - 4. Interlogix Model #RCR-REX or approved equal
- F. Cabling
 - 1. Card Reader Cable.
 - a. 6 conductor, 22 AWG, shielded.
 - b. Plenum rated.
 - c. 500' length limit.
 - 2. Electric Strike Cable.
 - a. 2 conductor, 18 AWG, shielded.
 - b. Plenum rated.
 - c. 500' length limit.
 - 3. Door Sensor Cable
 - a. 2 conductor, 22 AWG.
 - b. Plenum rated.
 - c. 500' length limit.
 - 4. Network Cable
 - a. Cat 6. See Specification 271500 for details

PART 3 – EXECUTION

3.1 STORAGE

- A. Store access system components in a cool, dry space prior to installation.

3.2 INSTALLATION

A. General

1. Install in accordance with Code, NRTL-listing and manufacturer's recommendations.
2. Wiring to comply with all National, State and Local Codes.
3. Locate devices as generally shown on Drawings and as indicated on installation instructions.
4. Provide conduit where cables are concealed in walls, in mechanical rooms, and in rooms without ceilings.

B. Proximity Readers

1. Standard type to be installed on solid walls. Use mullion type on any curtain wall systems or controlled doors with glass sidelights. Coordinate installation of any mullion style readers with supplier of frame system.
2. Where installed on masonry walls, readers shall be installed such that the top of the reader is even with block coursing

3.3 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 28 4611 – FIRE ALARM AND DETECTION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Included

1. Furnish and install an extension to the existing fire alarm and detection system in accordance with NFPA 72 and this specification.

B. Work not included

1. Where required, the Owner shall be responsible for:
 - a. Line lease or service fees associated with signal transmission (alarm, supervisor, and trouble) to a remote central station.
 - b. Any proprietary interface equipment not specified herein and required by the Owner's monitoring service.

1.2 SUBMITTALS

A. Shop Drawings

1. Submit information in accordance with Section 260500.
2. Indicate:
 - a. Mounting details.
 - b. Cabinet dimensions.
 - c. Wiring diagrams.
 - d. Description of devices.
 - e. Floor plan layout of fire alarm system indicating location of devices, wiring between devices, and intensities of audible and visual appliances. Upon request, the Engineer will furnish AutoCAD files of the floor plan. Submit one copy to Engineer for approval. Upon receipt of Engineer's approval, provide **additional four** copies. Submit one copy to Engineer. Remaining copies for Contractor use at the project site and for Record Drawing/Manual submittal at project closeout (redlined to indicate actual conditions of installation).

B. Record Manuals

1. Provide information in accordance with Section 260500.
2. Include complete data for operation and maintenance of the system, consisting of:
 - a. Wiring diagrams.
 - b. Testing.
 - c. Maintenance.
 - d. Description of system operation.
 - e. Addition of devices.
 - f. Frequency of testing procedures.
 - g. All data referenced in NFPA 72, 7.5.
3. Provide multiple copies (including shop drawing connection/riser diagram), one to remain in control panel, other copies for Record Manuals.

1.3 MANUFACTURER/SUPPLIER

- A. The system specified is based on equipment as manufactured by Johnson Controls Fire Protection: Simplex. All reference to model numbers and other pertinent information is intended to establish the standards of operational concepts, performance, quality and appearance, which must be met.
- B. All equipment shall be NRTL-listed, and shall be furnished by one manufacturer to ensure listing/equipment compatibility as required by NFPA 72.
- C. Supplier providing equipment and services under this Section shall have:
 - 1. A factory-authorized service center located in North Dakota within 250 miles of the project site. Referenced service center shall be under direct control of the Supplier, staffed by employees of the Supplier, and contain an inventory of replacement material requisite for timely maintenance. Referenced service center shall be operational for a minimum five-year period or have equivalent five-year industry experience with installation and programming prior to bid opening.
 - 2. A minimum of one employee at the above referenced service center certified by National Institute for Certification in Engineering Technologies (NICET). Certification shall be in the Fire Protection Engineering Technology field, Fire Alarm Systems sub-field, and shall be minimum Level III.
- D. Acceptable Suppliers:
 - 1. NewVison, 3320 Hamilton St. Unit 5, Bismarck, ND 58503 (701) 222-8888.
 - 2. SimplexGrinnell, 2821 Fiechtner Drive, Fargo, ND (800) 342-4668.

PART 2 – PRODUCTS

2.1 CENTRAL SYSTEM

- A. Existing Fire Alarm Control Panel (FACP)
- B. Alarm Initiating Devices
 - 1. Manual fire alarm station:
 - a. "Address capable"
 - b. Non-coded single action.
 - c. Provide two spare stations.
 - 2. Automatic area smoke detection station:
 - a. "Address" capable.
 - b. Combination photoelectric smoke and fixed heat plug-in "head" unit which mounts to a twist-lock base.
 - c. Individual station sensitivity levels are selected and monitored at the control panel.
 - d. Self-restoring.
 - e. White or Black color.
 - 1) Verify color for each area/room with architect and engineer.
 - f. Comply with UL 268.
 - g. Provide three spare stations.
 - 3. Automatic duct smoke detection station:
 - a. "Address" capable.

- b. Automatic photoelectric smoke detection station with associated duct housing and sampling tubes as required.
 - c. Refer to Motor and Equipment Schedule for equipment requiring duct detection.
- 4. Automatic area heat detection station:
 - a. "Address" capable.
 - b. Combination rate-of-rise and fixed temperature rate compensated sensing plug-in "head" unit, which mounts to a twist-lock base.
 - c. Individual station rate-of-rise temperature levels are selected and monitored at the control panel. Fixed temperature level is independent of rate-of-rise levels and shall operate at 135° F or 155° F. Select appropriate mode.
 - d. Locations requiring temperature ratings exceeding 155° F may include hardwired detector on an addressable base.
 - e. Self-restoring.
 - f. Low profile.
 - g. White or Black color.
 - 1) Verify color for each area/room with architect and engineer.
 - h. Provide two spare stations of each rating.

C. Alarm Notification Appliances

- 1. Audible alarm notification appliance
 - a. Piezoelectric type horn.
 - b. Flush mount.
 - c. Red or White finish.
 - 1) Verify color for each area/room with architect and engineer.
 - d. Comply with UL 464.
 - e. Class A operation.
- 2. Visual alarm notification appliance
 - a. Xenon or LED flash tube and associated lens/reflector system.
 - b. Comply with Americans With Disabilities Act (ADA).
 - c. Minimum of four (4) field selectable strobe intensity settings: 15, 30, 75 and 110 candela. All settings shall be UL 1971 listed for both wall and ceiling mount applications. Select strobe intensity for each unit as dictated by location and NFPA 72, 18.5.
 - d. "Fire" lettering on housing or lens.
 - e. Red or White finish.
 - 1) Verify color for each area/room with architect and engineer.
 - f. Comply with UL 1971.
 - g. Class A operation.
- 3. Where shown ganged together on Plans, combine audible and visual alarm notification appliances into one device.
- 4. Manufacturer: Same as control panel.

D. Auxiliary Devices

- 1. Magnetic door holder:
 - a. 24 volt or match existing.
 - b. Extra low profile for use with concealed wiring.
- 2. Individual addressable module (IAM):
 - a. Module provides supervised, location specific addressability, to a single initiating device by monitoring normally open, dry contacts. Closure of contacts initiates an alarm or trouble signal as required by the device being monitored.
 - b. Used to provide addressable monitoring of devices such as flow or tamper switches, etc.

- c. Powered directly from signaling line circuit. No separate power source required.
 - d. Mount in single-gang box, minimum 2-1/2" deep.
 - e. Included with flush or surface cover as required.
 - f. Provide a separate IAM for each device being monitored.
- 3. Individual addressable relay module (Relay IAM):
 - a. Module provides control and status tracking of a Form "C" SPDT, dry contact.
 - b. Module power and communications provided directly from the signaling line circuit.
 - c. Used to provide addressable control functions such as elevator recall, HVAC control, fan control, damper control, etc.
 - d. Mount in standard 4" square box.
 - e. Included with flush or surface cover as required.
- E. Manual Shutdown
 - 1. Manual shutdown capability included with motor starter.
- F. Automatic Shutdown
 - 1. Automatic shutdown capability for air handling equipment where required by NFPA 90A.
 - 2. Locate fan shutdown relays remote from fire alarm control panel, controlled by integral relay in fire alarm control panel, with bypass switch.
 - 3. Refer to Motor and Equipment Schedule for equipment requiring automatic shutdown.
 - 4. Wiring: Two-wire parallel independent circuit to fire alarm control panel.

PART 3 – EXECUTION

3.1 STORAGE

- A. Store fire alarm components in a cool, dry area prior to installation.

3.2 INSTALLATION

- A. General
 - 1. Install in accordance with code, product listing, and manufacturer's recommendations.
 - 2. Wiring to comply with all national, state and local fire codes.
 - 3. All fire alarm circuitry shall be installed in raceway unless otherwise noted. Refer to Section 260533 for acceptable raceways.
 - 4. Conductors:
 - a. Quantity as required by manufacturer.
 - b. Signaling Line Circuits (SLC):
 - 1) Two-conductor #18 AWG, twisted pair shielded or unshielded cable as per manufacturer requirements.
 - 2) NFPA 72 Class B, circuits do not return to fire alarm control panel.
 - c. Alarm notification appliance circuits (NAC):
 - 1) Solid, #14 AWG minimum, size for maximum 5% voltage drop.
 - 2) NFPA Class B.
 - 3) Audible appliances (horns) controlled separately from visual appliances.
 - 4) All visual appliances shall flash in synchronization.
 - d. Miscellaneous Circuits: (such as magnetic door holders & etc.)
 - 1) Solid, #14 AWG minimum, size for maximum 5% voltage drop.

- e. Color Coding: Manufacturer/Supplier requirements.
 - f. Enclosed in raceway system (i.e. conduit).
 - g. To ensure proper supervision of initiating and indicating circuitry, three wires maximum per wire-nut.
5. Raceway Systems:
- a. Size raceway systems and junction boxes as per NEC.
 - b. All junction boxes, junction box covers and raceway systems except those embedded directly in earth or concrete, or surface metal raceway systems (wiremold), shall be externally identified by permanent bright red paint suitable for the purpose, to easily distinguish from other communication or power raceway systems. Items shall be painted prior to installation. In addition to field painted conduit, factory painted conduit as manufactured by Allied Tube & Conduit (Fire Alarm™ EMT), acceptable.
 - c. Multiple circuits acceptable in same raceway system.
6. Terminations:
- a. Connect all devices according to manufacturer's data.
 - b. Made on terminal strips with separate joint for each conductor.
 - c. Number identify all strips as shown in wiring diagram included with manual.
 - d. Number identify all conductors to agree with terminal strip numbering.
 - e. When required, end of line devices to be mounted on terminal strips in the FACP.
 - f. Wire-nut terminating not acceptable.
7. Do not zone alarm notification appliances. Rather, route notification appliance circuits (NAC's) with signaling line circuits (SLC's). Terminate and jumper as required to maintain supervision on identified terminal strips.
8. Locate devices as generally shown on Drawings and as specifically indicated on installation instructions.
9. Remote fan shut-down relays to be mounted near controller or equipment.
10. Where control panel is shown to be surface-mounted, provide 3/4" grade AD, fire-resistant, gray painted (including edges), plywood backing.
11. Provide 1/2" conduit from fire alarm control panel to nearest network rack offering internet access. Provide a four-pair minimum Category 5e UTP data cable terminated to the IP communicator module. Ensure owner's internet access equipment complies with secondary power requirements as required by NFPA 72. If owner provided internet access is not available, provide additional dedicated IP equipment as required to obtain internet service in conformance with NFPA 72.
12. Provide elevator/fire alarm interface as per Section 262822.

B. Spot-Type Detectors

- 1. Locate as generally shown on Drawings and as specifically indicated in NFPA 72 and on installation instructions.
 - a. All detectors in rooms with gas fired equipment shall include CO sensor.
- 2. Provide protective plastic wrapping to prevent entrance of construction dust. Field-install during construction. Remove immediately prior to supplier testing. Replace protective plastic wrapping and remove day of final inspection.
- 3. All smoke/heat detection devices shall be located a minimum of 3' from any supply, return, or exhaust air diffusers/grills.

C. Duct Detectors

- 1. Installed and arranged to automatically initiate general alarm.

2. Provide at a suitable location in the return air stream prior to exhausting from building or being diluted by outside air.
3. Provide at a suitable location in main supply duct on downstream side of filters.
4. Refer to Motor and Equipment Schedule for equipment requiring duct detection.
5. Locate as specifically indicated in NFPA 72 and on installation instructions. Coordinate with supplier's representative prior to installation, exact location to ensure accurate sampling of air stream. Provide quantity as required by duct geometry.
6. Do not install head on sampling tube base in housing until final supplier testing, unless a protective cover is included with the detector head.

3.3 TESTS

- A. Prior to final inspection, verify that the fire alarm system is in proper working condition, free from false alarms. Furnish a letter of verification to Engineer indicating that the system has been tested by manufacturer's representative and is found to be complete and functional. List date of test and name of manufacturer's representative. Indicate in letter that testing was in accordance with NFPA 72, Chapter 14, including re-acceptance testing when applicable. Include copies in control panel and Record Manuals.
- B. Notify Owner, Engineer, and Local Fire Marshall or Fire Chief one week in advance of scheduled tests. Electrical Contractor responsible for test coordination and scheduling.

3.4 INSTRUCTIONS

- A. Manufacturer's representative shall instruct Owner in proper operation, maintenance and testing of complete fire alarm and detection system. Indicate on letter of verification, name of Owner's representative receiving instructions.
- B. Record instructions and include with Record Manuals in accordance with Section 260500.

3.5 CLEANING

- A. **Clean** and **vacuum interior** to remove all wire and insulation scraps, dust and dirt.
- B. Clean all exposed surfaces immediately prior to final inspection.

END OF SECTION

SECTION 31 1000 – SITE CLEARING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Clearing and protection of vegetation.
 - 2. Removal of existing debris and site materials as indicated by the Plans.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

- A. Protect benchmarks, survey control points, and existing site features to remain in place. Damage to these items shall be repaired by the Contractor at no additional expense to the Owner.
- B. Ensure all necessary erosion and sediment control measures and permits are in place prior to commencing site clearing.
- C. Minimize production of dust due to clearing operations. Do not use water if it will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- D. Clear areas as indicated by the Plans.
- E. Apply an approved soil sterilant where existing vegetation is replaced by gravel, concrete, or asphalt.
- F. Backfill any voids left from site removals per Specification Section 31 2323 - Fill.

3.02 EXISTING UTILITIES AND AS-BUILT ELEMENTS

- A. Coordinate work with utility companies as needed. Notify utility companies before starting work and comply with their requirements. Obtain required permits for Work, if needed.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without the proper permits from the authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

- A. Do not remove or damage vegetation that is not shown for removal, or that is outside the property lines.
- B. In areas where vegetation must be removed and no subgrade preparation is specified, remove vegetation with minimum disturbance to the subsoil.
- C. Dispose of removed vegetation off-site, unless otherwise indicated

- E. Remove stumps and roots to a minimum depth of 18-inches below proposed finish grade. Fill holes left by removal of stumps and roots using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
- F. If vegetation outside the removal limits is damaged or destroyed due to construction operations, replace these items at no cost to the Owner.

3.04 PAVEMENT AND BASE

- A. Remove pavement and base in areas as noted by the Plans.
- B. Saw a vertical full-depth cut along the proposed removal edge of pavements prior to removal to provide a clean vertical face along the edge of the remaining pavement after removal is complete. Remove concrete pavements to the nearest joint when possible.
- C. Take care during removals to avoid damage to adjacent pavements and site features to remain.
- D. Remove aggregate base beneath pavement through its full depth, where required.
- E. Dispose of removed pavements and base materials off-site, unless otherwise noted.

3.05 DEBRIS

- A. Remove debris, junk, and trash from the site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from the site, and from public and private lands.

END OF SECTION

SECTION 31 2200 - GRADING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Removal and storage of topsoil.
 - 2. Finish grading.
 - 3. Topsoil replacement.
- B. Reference Reports:
 - 1. Report of Geotechnical Exploration.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil - Soil Type: Re-use removed topsoil from the site.
 - 1. Graded and free of clumps larger than 1½-inch in diameter.
 - 2. Free of roots, rocks larger than ½-inch, subsoil, debris, large weeds, and foreign matter.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmarks and intended elevations for the Work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above and below grade utilities to remain.
- D. Protect site features to remain, including but not limited to, benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from damage.
- E. Ensure all erosion and sediment control measures and permits are in place prior to commencing site grading.

3.03 ROUGH GRADING

- A. Remove and salvage topsoil thru its full depth from areas to be further excavated, re-landscaped, or re-graded, without mixing it with foreign materials. Stockpile and stabilize an adequate quantity topsoil for re-use after completion of grading.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

- E. Export excess subsoils remaining after completion of grading, or, if additional material is needed to complete site grading, import suitable fill material to meet the proposed site grades.
- F. Verify that all soil types and compaction of soils meet the requirements of the Geotechnical Report. If questionable soils are encountered on-site that are not discussed in the Geotechnical Report, contact the Architect immediately to determine what measures should be taken to correct the subgrade issues.
- G. When excavating through roots, perform work by hand and cut roots with sharp axe.

3.04 FINISH GRADING

- A. Before Finish Grading:
 - 1. Verify subgrade has been contoured per the Plans.
 - 2. Verify that compaction and/or soils meet the requirements of the Geotechnical Report.
 - 3. Verify positive drainage of the subgrade.
- B. Slope grade away from building minimum 2-inches in 10-feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- C. Remove debris, roots, branches, stones larger than ½-inch in size. Remove soil contaminated with petroleum products.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3-inches.
- E. Place topsoil during dry weather.
- F. Remove roots, weeds, rocks, and foreign material while spreading.
- G. Near plants spread topsoil manually to prevent damage.
- H. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- I. Lightly compact placed topsoil.

3.05 TOLERANCES

- A. Maximum Variation of Surface Flatness: $\pm\frac{1}{2}$ -inch in 10-feet.

3.06 REPAIR AND RESTORATION

- A. All exposed soil areas must be stabilized per the North Dakota Pollutant Discharge Elimination System (NDPDES) permit for this site throughout the duration of construction. This may require additional erosion control measures than what is indicated within the Plans. Contractor shall provide all appropriate erosion control measures for their work operations.
- B. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

3.07 CLEANING

- A. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 2316 – EXCAVATION

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Excavating for slabs-on-grade, paving, and areas outside of the proposed building footprint.
- B. Reference Standards:
 - 1. North Dakota Department of Transportation (NDDOT) Standard Specifications for Road and Bridge Construction, current edition, including applicable Supplemental Specifications published on the date indicated on the Plans.
 - 2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 3. AASHTO T 191 – Density of Soil In-Place by the Sand Cone Method.
 - 4. ASTM D 2167 – Density and Unit Weight of Soil in Place by the Rubber-Balloon Method.
 - 5. AASHTO T 310 – In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
 - 6. AASHTO T 265 – Laboratory Determination of Moisture Content of Soils.
 - 7. ASTM D 4643 – Determination of Moisture Content of Soil by the Microwave Oven Method.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmarks and intended elevations for the work are as indicated.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Protect benchmarks, survey control points, existing structures, fences, plant life, sidewalks, paving, and curbs and other features that are to remain from excavating equipment and vehicular traffic.
- C. Locate, identify, and protect utilities that are to remain from damage.

3.03 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 4-feet to angle of repose or less until shored.
- D. Do not interfere with 45 degree bearing splay of foundations.

- E. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323 - Fill.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation.
- G. Remove excavated material that is unsuitable for re-use from site.
- H. Export excess subsoils remaining after completion of grading.

3.04 FIELD QUALITY CONTROL

- A. Provide for visual inspection of load-bearing excavated surfaces before placement of slabs on-grade, paving, or structure.

3.05 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

SECTION 31 2323 – FILL

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Filling, backfilling, and compacting for slabs-on-grade, and areas outside of the proposed building footprint.
- B. Reference Standards:
 - 1. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; American Association of State Highway and Transportation Officials.
 - 2. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - 3. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - 4. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)).
 - 5. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
 - 6. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
 - 7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
 - 8. North Dakota Department of Transportation (NDDOT) Standard Specifications for Road and Bridge Construction, current edition, including applicable Supplemental Specifications published on the date indicated on the Plans.

1.02 SUBMITTALS

- A. Compaction Density Test Reports.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. General Fill: Subsoil excavated on-site, unless recommended otherwise by the Soils Exploration Report.
 - 1. Graded.
 - 2. Free of lumps larger than 3-inches, rocks larger than 2-inches, organic material, and debris.
- B. Structural Fill: As defined by the Structural Plans and/or Specifications.
- C. Granular Fill: Base aggregate, conforming to State of North Dakota Department of Transportation Specification Section 816 Class 5 Aggregate Base or section 817 Salvaged Base Coarse standard.
- D. Sand: Natural, river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
 - 1. Grade in accordance with ASTM D2487 Group Symbol SW.
- E. Topsoil - Fill Type: Friable loam; imported borrow if topsoil from site is not adequate.

2.02 SOURCE QUALITY CONTROL

- A. If tests indicate materials do not meet specified requirements, change material and retest.

2.03 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles per the following requirements:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.
 - 4. Do not place stockpiles in standing water or locations where water will drain.
 - 5. Place in a location that does not adversely affect the work being performed on-site.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.

3.02 PREPARATION

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

3.03 FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Fill up to subgrade elevations unless otherwise indicated. If additional material is needed to complete site grading, import suitable fill material to meet the proposed site grades.
- C. Employ a placement method that does not disturb or damage other work.
- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen, or spongy subgrade surfaces.
- E. Slope grade away from building minimum 2-inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- F. Place in lifts with a maximum compacted thickness of 8-inches, unless otherwise recommended by the geotechnical report.
- G. Maintain moisture during compaction to within the following tolerances attain required compaction density, unless otherwise recommended by the geotechnical report:
 - 1. Clay: -1% to +3% of optimum moisture content
 - 2. Sand: $\pm 3\%$ of optimum moisture content
- H. Maintain the following minimum compaction densities relative to the soils maximum dry density as determined using the Standard Proctor per ASTM D698, unless otherwise recommended by the geotechnical report:
 - 1. Under foundations: 98%
 - 2. Under paving, slabs-on-grade, and similar construction: 95%

3. Under landscape surfaces: 90%

I. Reshape and re-compact fills subjected to vehicular traffic.

3.04 TOLERANCES

A. Top Surface of General Filling: $\pm 1/2$ -inch from required elevations.

3.05 FIELD QUALITY CONTROL

A. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D3017, or ASTM D6938.

B. Evaluate results in relation to compaction curve determined by testing backfill material in accordance with ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: Each 1-foot lift of every 2,500 sf of compacted area for mass grading, pavement subgrade, and aggregate base course; Each lift for every 100 linear feet of compacted wall backfill.

E. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.06 CLEANING

A. Leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 1123 – AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Aggregate Base Course for site pavements.
- B. Reference Standards:
 - 1. North Dakota Department of Transportation (NDDOT) Standard Specifications for Road and Bridge Construction, current edition, including applicable Supplemental Specifications published on the date indicated on the Plans.

1.02 SUBMITTALS

- A. Results of Aggregate Composition laboratory tests on proposed and actual materials used to verify that they meet all specified requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on-site in advance of need.
- B. Aggregate Storage, General:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Class 5 Aggregate Base: Shall meet NDDOT Standard Specification Section 816.01-02 for Class 5 Aggregate.

2.02 SOURCE QUALITY CONTROL

- A. Provide materials of each type from same source throughout the Work, unless otherwise approved.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmarks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting according to Section 31 2323 Fill.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 PLACEMENT

- A. Under Portland Cement Concrete or Bituminous Paving:
 - 1. Place Class 5 Aggregate Base to a total compacted thickness as specified by the Plans.
 - 2. Compact aggregate until there is no sign of visible movement under the compacting equipment.
- C. Place aggregate in maximum 6-inch layers.
- D. Level and contour surfaces to elevations and gradients indicated.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.04 FIELD QUALITY CONTROL

- A. If work does not meet specified requirements, remove work, replace, and retest.

3.05 CLEANING

- A. Remove unused stockpiled materials and leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 1313 – CONCRETE PAVING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Concrete parking lot, sidewalks, curbs, gutters, valley gutters, and driveways.
- B. Reference Standards:
 - 1. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
 - 2. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
 - 3. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
 - 4. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
 - 5. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
 - 6. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - 7. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 8. ASTM C33/C33M - Standard Specification for Concrete Aggregates.
 - 9. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 10. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete.
 - 11. ASTM C150/C150M - Standard Specification for Portland Cement.
 - 12. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
 - 13. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 14. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - 15. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete.
 - 16. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - 17. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (nonextruding and Resilient Bituminous Types).
 - 18. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - 19. North Dakota Department of Transportation (NDDOT) Standard Specifications for Road and Bridge Construction, current edition, including applicable Supplemental Specifications published on the date indicated on the Plans.

1.02 SUBMITTALS

- A. Provide a concrete mix design prepared by an independent testing laboratory.
- B. Provide manufacturers' product data.
- C. If requested by Architect, provide written explanation from Ready-Mix Supplier as to how concrete will be delivered and what, if any, special measures will be required.

- D. A meeting with the contractor, ready-mix supplier, testing firm and Architect in attendance, is required. The meeting shall be held a minimum of 10-day prior to the beginning of construction. Topics to be addressed will include mix design, specifications, expectations, delivery communications, and testing requirements.
- E. Prior to pouring concrete in cold weather, a written request outlining the use of accelerating admixture shall be submitted to the Architect for approval.
- F. Prior to pouring concrete in hot weather, a written request outlining the use of set retarding admixture shall be submitted to the Architect for approval.

1.03 QUALITY ASSURANCE

- A. Acquire cement and aggregate from same source for all work.
- B. Provide written documentation for cement, listing manufacturer, and certifying that cement meets specifications.
- C. Concrete shall not be poured when the air temperature may fall below 35° F during the pouring or within 24-hours unless preparations are made and precautions taken to prevent any damage to the concrete from the low temperature as approved by the Architect.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver and place concrete in a manner that provides minimum segregation.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Avoid over spraying with curing compound.
- B. Properly dispose of all excess curing compound.
- C. Utilize appropriate protection against inclement weather.
- D. Designate concrete wash area that all trucks delivering concrete to the site shall use. Area must not impact public property, watercourses, water bodies, or wetlands.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Form Materials: Conform to ACI 301.

2.02 CEMENT

- A. Cement shall be an approved and established brand of Portland Cement Type I, Type IL, Type IA or Type II. Different brands of cement, or the same brand of cement from different mills, shall not be mixed during use without permission from the Architect.
- B. Cement shall be stored in a suitable manner to prevent moisture damage; cement which is partially set or which contains lumps or cakes shall be rejected.
- C. The vendor shall provide backup documentation and certifications that the cement used meets these requirements.

2.03 FLYASH

- A. Fly Ash shall be Class F and meet requirements of AASHTO M-295 for Portland Cement Concrete.
- B. Fly Ash will be allowed as a cement replacement on a 1:1 ratio, up to a maximum of 29% by weight. Fly ash content of mixes will be reduced to a maximum of 15% replacement of cement in cold weather concrete conditions. Cold weather exists when the air temperature has fallen to or is expected to fall below 40°F (4°C) during the protection period, which is defined as the time required to prevent concrete from being affected by exposure to cold weather. High-Early Strength concrete mixes may include up to 15% direct replacement of cement with fly ash.

2.04 AGGREGATES

- A. Aggregate mixes shall meet the requirements of NDDOT Standard Specification Section 802.01 C.

2.05 WATER

- A. Water for concrete shall be clean and free from oil, acid, alkali, and vegetable substances. Water from non-potable sources shall be tested according to AASHTO T-26.

2.06 ADMIXTURES

- A. Air Entrainment
 - 1. Air entrainment admixture or air entrained cement is to be used. Entrained air content shall be targeted for 6% and will be between 5% and 8% as measured at the point of placement.
- B. Chemical Entrainment
 - 1. Chemical admixtures shall conform to AASHTO M194.
- C. Color Additives
 - 1. Color additives shall conform to ASTM C979, be resistant to lime and other alkali, and be resistant to sunlight. Color additives shall be mixed per the manufacturer's recommendations and until additives are uniformly dispersed throughout the mix. Dosage rate of admixtures shall not exceed 10% of weight of cementitious materials in the mix. Color shall be approved by the Architect prior to finalizing the mix design.

2.07 JOINT MATERIAL

- A. Expansion Joints
 - 1. If expansion or isolation joints are required, they shall be as indicated in the drawings or details. Joint material thickness will be as specified and/or approved, or per manufacturer's recommendation. It shall extend the full width of the pavement slab and curb, and any concrete at the ends when the forms are removed shall be chipped away. The dowel support, where required, shall securely and rigidly hold the dowel bars and pre-molded filler in correct position during the paving operation. All expansion/isolation joint faces shall be cleaned and sealed with silicone sealant or equal to produce a slightly concave surface ¼ inch below the concrete surface.
 - 2. The entire expansion joint assembly shall be of a type approved by the Architect.
- B. Poured Joint Filler may be polymeric or silicone.
 - 1. Polymeric Sealant: The material for filling poured expansion and contraction joints and cracks shall be hot poured elastic type and shall conform to the requirements of ASTM D-1190. The material shall be composed of a homogeneous blend of virgin polymers, plasticizers, special fillers and

asphalt compounded specifically for the sealing of cracks in asphalt or concrete pavement. Ground cured rubber scrap shall not be used.

2. Silicone Joint Sealant: The Silicone sealant shall be a Low Modulus Silicone Sealant meeting the requirements of the 2008 NDDOT Specifications Section 826.02.B.1. Self-leveling silicone sealants will not be allowed.

2.08 CURING COMPOUNTS

- A. All curing compounds shall be applied in accordance with the manufacturer's recommendations.
- B. Parking Lot, Driveway, and Sidewalk Paving
 1. White pigmented liquid curing compound conforming to the requirements of AASHTO M148 Type 2, Class B or AASHTO M 148 Type 2.
- C. Separate Curb and Gutter
 1. White pigmented liquid curing compound conforming to the requirements of AASHTO M148 Type 2.

2.09 MIX REQUIREMENTS

- A. A mix design shall be provided to the approved Architect a minimum of 48-hours before pouring. Any revisions to the mix design must be approved by the Architect.
- B. One cubic yard of mixed concrete in place shall contain not less than 564 lbs. minimum of cementitious materials.
- C. The water-cement ratio shall not exceed 0.45.
- D. The slump shall not exceed four (4) inches for formed paving, or two (2) inches for slip-form paving.
- E. 28-day compressive strength shall meet 4000 psi for standard concrete
- F. Entrained air content shall be targeted for 6% and will be between 5% and 8%.

2.10 HIGH-EARLY STRENGTH CONCRETE

- A. High-early strength concrete may be obtained by the following method:
 1. When Type I, Type II, Type IA, or Type IB cement is used, the cement content shall be increased to 7.2 sacks of cement per cubic yard (676 pounds). No flyash is allowed. Water-cement ratios will be shown in NDDOT Table 802.01B.1 for the class of concrete shown.
 2. The use of non-chloride accelerators for high-early strength concrete is allowed.
- B. The use of hydration stabilizers to preserve workability of high-early strength concrete in route to the project is allowed.
- C. High-early strength concrete shall be used when specified in the Contract Documents.
- D. When the Contractor requests and obtains permission from Architect to use high-early strength concrete. No additional payment will be made for any extra costs incurred in producing and placing the high-early strength concrete.
- E. Contractor shall provide environment to ensure that high-early strength concrete mixes will attain field strength of 3000 psi compressive strength prior to opening to public traffic. At no time may concrete

exceed 90°F in temperature while under blankets or other protection devices, nor fall below 60°F during the 24-hour period.

2.11 MIXING AND TRANSPORTING CONCRETE

- A. Procedures shall conform to NDDOT Section 155.03 and 155.04.

2.12 AUXILIARY FINISHING EQUIPMENT AND MATERIAL

- A. Straight Edge
 - 1. Two or more ten (10) foot straight edges of an approved type shall be used. Extra blades shall be provided and used when previously used edges become wavy and warped.
- B. Floats
 - 1. Approved long handled floats, each having a blade at least 0.5-feet in length and 6-inches in width.
- C. Master Straight Edge
 - 1. All straight edges shall be tested by the master straight edge before being used and shall be tested frequently during their use.
- D. Final Surface Finish
 - 1. The final surface and the concrete pavement shall have a uniform gritty texture, free from excessive harshness and true to the graded and cross sections shown on the plans.
 - 2. Before brooming or burlap dragging is complete, and before the concrete has taken its initial set, the edges of the slab shall be carefully finished with an edger having a ¼" radius.

2.13 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 deformed billet steel bars; unfinished.
- B. Steel Welded Wire Reinforcement: Plain type, ASTM A185/A185M; in flat sheets; unfinished.
- C. Tie Bars: ASTM A615/A615M Grade 60; deformed billet steel bars; unfinished.
- D. Dowel Bars: ASTM A615/A615M Grade 60, smooth steel bars, unfinished; or ¼" thick Diamond Dowels®; or approved equal.

PART 3 CONSTRUCTION

3.01 EXAMINATION

- A. Verify compacted sub-grade and/or sub-base are acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.02 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Notify Architect minimum 24-hours prior to commencement of concreting operations.

3.03 FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
- C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.04 REINFORCEMENT

- A. When required, place rebar reinforcement 2-inches from top of slabs-on-grade and a minimum of 2-inches from slab edges.
- B. Interrupt continuous reinforcement at expansion/isolation joints.
- C. Place dowels to achieve pavement and curb alignment as detailed.

3.05 COLD WEATHER POURING

- A. Prior to pouring in cold weather, a written request must be made and approved by the Architect. Any concrete damaged by freezing shall be replaced by the Contractor at his own expense. Temperature of the concrete when deposited in the forms shall be between 60° and 90°F and maintained at a minimum temperature of 40°F for at least 5 days after placing, or until the concrete attains a compressive strength of 3000 psi. Concrete shall not be placed on a frozen subgrade or base. Any part of pavement damaged from traffic or other causes occurring prior to the acceptance of the pavement shall be repaired to the satisfaction of the Architect at the Contractor's expense.
- B. Admixtures for curing or temperature control shall be used only as permitted or directed by the Architect. The admixtures shall not be considered as a substitute for any specified curing requirement.

3.06 JOINTS AND SAWING

- A. Joints in concrete pavement shall be of the design specified and shall be constructed at the spacing shown on the plans. The contractor shall establish the joint locations in the field from the plans or standard details. All joints shall be sawed along a true and straight line established by the Contractor and shall not deviate at any point by more than ½-inch from the established line.

3.07 CONTRACTION JOINTS AND SAWING

- A. The location of each contraction joint shall be marked in a manner satisfactory to the Architect, prior to placement of the concrete and, in the case of joints that are to be sawed. The markings shall be transferred to the fresh concrete as soon as the final finishing operations have been completed. All contraction joints shall be sawed to a sufficient depth to control cracking, but in no case to a depth less than ¼ of the thickness of the pavement. Joints constructed in the pavement shall be sawcut through the integral or separate curb. The Contractor shall be responsible for sawing to a depth that will prevent uncontrolled cracking. A sufficient number of saw cuts shall be made as soon as possible to relieve the contraction joint tension in the slab. Remaining saw cuts must be made within 24-hours after pouring.
- B. The initial sawing shall be accomplished as soon as the condition of the concrete will permit without raveling and before random cracking occurs. The sequence of initial sawing shall be at the Contractor's option. The sawing shall be immediately delayed if any raveling occurs. Water under nozzle pressure shall be used to remove the sawing residue from each joint and the pavement surface immediately after completing the sawing of that joint. Widening the joints to full width as per dimensions shown on

the jointing/sealing detail shall not be performed until the concrete has cured for at least 24-hours and shall be delayed longer when the sawing causes joint raveling.

- C. The early entry dry saw "Soft Cut" method of sawing will only be allowed with the Architects approval for the initial saw cutting. If uncontrolled cracking occurs, removal and replacement of damaged concrete will be at the Contractor's expense. Concrete is to be removed at the nearest planned joint. The removal and replacement method shall be approved by the Architect.

3.08 EXPANSION JOINTS

- A. Expansion joints shall be spaced as shown on the plans and shall be of the preformed type and shall extend entirely through the depth and width of the pavement and through all integral curbs. No concrete shall be left above the expansion material or across the joint but shall be cut away after the forms are removed.
- B. The expansion material and dowel assembly, where required, shall be accurately and firmly staked to the subgrade. The top edge of the filler shall be set 2-inches below the pavement surface. During the placing of the concrete, the top edge of the filler shall be protected by a removable channel cap. After the concrete has been placed and finished, the cap shall be removed and the joint edged to the specified radius. All expansion/isolation joints shall be cleaned and sealed with silicone sealant to produce a slightly concave surface approximately ¼-inch below the concrete surface.
- C. Before the pavement is opened to permanent traffic, the joint shall be cleaned so that there is a clear space of the specified width for the full depth and width of the pavement. It shall then be filled with joint filler which, when cooled, shall be ¼-inch below the surface of the pavement. Any sealant material on the surface of the pavement shall be removed at the Contractor's expense.

3.09 CONSTRUCTION JOINTS

- A. Construction joints shall be constructed at the end of each day and whenever the placing of the concrete is suspended for more than 45 minutes. When the work is suspended near the proper location for an expansion joint, the expansion joint shall be installed in the manner previously specified, except that the concrete shall only be placed on one side of the header. When work is resumed, it shall be placed on the other side.
- B. When work is suspended at other locations, a contraction joint shall be formed by securely staking in place, at right angles to the subgrade and centerline of the pavement, a bulkhead of wood or metal cut to the cross section of the pavement and then depositing concrete against it. Before the work is resumed, the bulkhead shall be removed and concrete placed against the face of the older concrete.
- C. Construction joints shall only be constructed at planned joint locations.
- D. Dowel bars shall be installed for load transfer across the joint if specified by the plans. The dowel bars shall be either installed with the construction joint or later drilled in place. If installed with construction joint they shall be held in place midway across the joint, parallel to both the surface and the centerline of the slab by a dowel splicer basket assembly, self-supported dowel sleeve, or other supporting device approved by the Architect. The dowel bars shall be installed within the tolerances specified above for placing reinforcement. One end of the dowel shall be painted or coated with an approved lubricant.

3.10 PAVEMENT FINISHING

- A. Strike-off and compaction shall be done by both vibration and screed processes. Separate power machines may be used for each process or both processes may be combined in the same machine, provided controls exist enabling the operator to apply either operation separately or both combined.

- B. When weather conditions cause rapid drying of the pavement surface a fine mist or fog spray applied to the concrete surface shall be permitted only if approved by the Architect. Using any other method to apply water to the concrete surface will not be permitted and will result in non-payment, replacement, and/or repair of the wetted area as determined by the Architect.
- C. Forms shall be left in place for at least 12-hours after placing the concrete, and the method of removing them shall not damage or mar the concrete.
- D. The finished surface of the pavement must conform to the grade, alignment, and contour shown on the plans. Immediately following the floating operation, the Contractor shall test the slab surface for trueness with a 10-foot straight edge. The straightedge shall be placed parallel to the pavement centerline and passed over the slab to reveal any high areas or depressions. The high areas or depressions shall be cut or filled as necessary with the long-handled floats and the area checked again with the straight edge. Successive advances of the straight edge shall overlap by $\frac{1}{2}$ the length of the straightedge. The entire surface shall be checked until all variations in excess of $\frac{1}{4}$ " in 10' have been eliminated. Special care shall be taken at all headers to ensure this variation is held to a minimum.

3.11 CURB FINISHING

- A. Curb and Gutter shall be constructed using a slip-form machine or fixed forms. Fixed forms shall be full depth.
- B. No grout shall be used to finish the face of the curb. After the concrete is poured into the forms, it shall be puddled, vibrated and spaded so as to ensure a thorough, dense mixture, eliminate air pockets, and create uniform and smooth sides. Any honeycombing voids, or exposed aggregate on the back of the curb shall be grouted.
- C. When weather conditions cause rapid drying of the pavement surface, a fine mist or fog spray applied to the concrete surface shall be permitted only if approved by the Architect. Using any other method to apply water to the concrete surface will not be permitted and will result in non-payment, replacement, and/or repair of the wetted area as determined by the Architect.
- D. Before the curb concrete has thoroughly set, and while the concrete is still green, the forms shall be removed and the front and top side finished with a float or steel trowel to make a uniform finished surface.
 - 1. Rounding Corners
 - a. Whenever corners are to be rounded, special steel trowels shall be used while the concrete is still workable and the corners constructed to the dimensions herein specified. For combined curb and gutter, the top and side of the curb and gutter may be finished by means of a special shaped trowel or by a curb and gutter machine which spaces the entire surface in accordance with the specified dimensions. This trowel shall be used immediately upon removing the front form while the concrete is still workable but firm enough to stand up.
 - 2. Smoothness
 - a. The top and face of the curb and also the top of the apron on combined curb and gutter must be finished true to line and grade without any irregularities of surface noticeable to the eye. No portion of the surface or face of the curb or gutter section shall depart for more than $\frac{1}{4}$ -inch from a straight edge 10-feet in length, placed on the curb parallel to the center line of the street, nor shall any part of the exposed surface present a wavy appearance.
- E. All joints shall be formed and placed at the specified intervals. When constructed adjacent to concrete pavement, joints shall match the pavement joints. Joint sealing shall be as specified.

- F. Concrete shall cure for 72-hours. All surfaces not protected by forms during this period shall be covered with a curing compound.

3.12 PAVEMENT FINAL SURFACE FINISH

- A. The edges of the pavement shall be left smooth and true to line and finished at about the time and concrete takes its initial set.
- B. After surface irregularities have been removed and before the concrete attains an initial set, the pavement shall be uniformly textured using a seamless strip of artificial grass, burlap, or brooming.
- C. In case that an extruding paving machine is used, the texturing material being pulled longitudinally shall be mounted to a self-propelled bridge, operated off the paving string line, and shall not deviate at any point by more than ½-inch from the established alignment.
- D. Formed paving brooms shall be drawn across the surface at right angles to the centerline of the pavement, with the stroke of the broom slightly overlapping adjacent strokes. The brooming operation shall apply a uniform texture with 1/16-to-1/8-inch deep striations. Brooms shall be washed and dried at frequent intervals during the day. Any long or coarse bristles that may cause surface irregularities shall be trimmed or cut out, and any brooms that have become worn out shall be discarded.
- E. Upon completion of the final finishing the surface texture shall be uniform in appearance and free of surface water, rough or porous spots, irregularities, depressions, and other objectionable features.
- F. For pavement in the public right-of-way, the Contractor shall mark in each 3,000 square feet of pavement, every 100 LF for continuous pours of new curb and gutter and/or sidewalk, at each end of property lines, every curb and gutter and/or sidewalk patch done per lot and each driveway by stamping the Contractor's name, address and year in which the pavement was constructed. The stamped letter should be 1-inch high and ¼-inch deep. Contractor's stamp must be approved by the Architect prior to the beginning of construction. Contractor shall be responsible for changing the date on the stamp each year.

3.13 CURING AND PROTECTION

- A. Normal Pavement: As soon as the concrete has been textured, the Contractor shall start curing operations. The finished surface shall be sprayed with an approved curing agent on all exposed faces. Sufficient curing compound shall be applied at a rate of approximately 200 SF/gal to ensure a coating as white as a sheet of paper. In lieu of curing agent, the concrete may be cured by wet burlap or other methods approved by the Architect. When wet burlap or plastic film is used for curing, the curing period shall be at least 5 days. The concrete surface must not be pitted from or damaged from application of water or incidental rain. The Contractor shall protect all concrete from weather conditions, traffic damage, or any other causes occurring prior to its final acceptance. Any damaged section shall be repaired at the Contractor's expense.
- B. Colored Pavement: Colored pavement shall be cured with an approved clear curing compound generally defined as a dissipating cure or a wax based cure matching the color of the decorative concrete. Curing procedures should generally follow the guidelines of the color admixture supplier for the concrete in the pavement.
- C. Timing of Curing Compound Application: Curing procedures should be undertaken within ½-hour of completion of finishing operations or before the wet sheen on the surface or the concrete disappears, whichever occurs first. Evaporation retarders shall be used for interim protection whenever hot, windy or dry conditions quantified by evaporation rates exceeding 0.2 pounds per square foot per hour exist

and shall be used in accordance with manufacturer's recommendations. Evaporation retarders shall not be used as a finishing aid.

3.14 JOINT FILLING AND SEALING

- A. Joints shall be filled within 10-days after placement and before opening pavement to traffic.
- B. All vertical joint faces shall be cleaned. Oil, asphalt, curing compound, paint, rust, and other foreign materials shall be completely removed. Just before the joints are sealed, the Contractor shall clean the joints with compressed air at a working pressure of at least 90 psi. The joints shall not be sealed when the air temperature is below 40° F.
- C. Backer rod shall be used in silicone sealed joints to control the depth of the filler/sealer material. Rod backer is not required on hot pours to achieve the desired shape of the material and support the material against indentation and sag. The backer rod shall be compatible with the filler/sealer and not subject to the absorption of water. Clean all surfaces of excess filler and sealant.
- D. Contraction/Construction joints constructed in the pavement shall be widened and sealed through the integral or separate curb.
 - 1. Hot Pour Sealant.
 - a. The joint filler shall be forced into the joint with a pressure type applicator capable of filling the joint from the bottom up to a height approximately ¼-inch below the pavement surface, without any overflow or spillage onto the pavement surface. Clean all surfaces of excess sealant.
 - 2. Silicone Sealant
 - a. Silicone joint sealer may be used in lieu of hot pour elastic filler. The sealant shall be tooled to produce a slightly concave surface approximately ¼-inch below the pavement surface. Self-leveling sealant will not be allowed.

3.15 PROTECTION OF PAVEMENT

- A. This procedure shall conform to Section 550.04 N. of the 2008 NDDOT Specifications

3.16 LOCATION OF EXISTING UTILITIES

- A. Existing manholes, gate valves, and stop boxes have been shown to direct the Contractor's attention to their existence. The Contractor is cautioned that not all utilities have been shown and their location is not guaranteed. The Contractor is responsible for determining the exact location of existing utilities that affect the installation of the paving.

3.17 TOLERANCES

- A. Maximum Variation of Surface Flatness: $\pm\frac{1}{4}$ -inch in 10-feet.
- B. Maximum Variation from True Position: $\pm\frac{1}{4}$ -inch.

3.18 FIELD QUALITY CONTROL

- A. Contractor shall provide a testing firm to complete fresh concrete and compression testing as required herein.
- B. When casting cylinders, provide the following:
 - 1. Field Cure - as required to determine when pavement can be opened to traffic
 - 2. 2 - 7 Day (lab cured)

3. 2 - 28 Day (lab cured)
 4. 2 - Extras
- C. Testing is required at 100 cubic yard intervals for pours that exceed 100 cubic yards. For pours that are less than 100 cubic yards, testing will be done on every pour. A Field Technician will be required to obtain batch tickets from the delivery driver on every test cylinder that is to be tested. A Field Technician shall complete slump and air testing at the project location. Concrete test specimens for compression strength tests will be made and cured according to accepted ASTM procedures.
- D. The Testing Firms shall comply with ACI 318 in regards to supplying Architect, Contractors, concrete suppliers and other designated individuals with notification of concrete field test results such as slump, water content and air content immediately, and compression strength test results within 48-hours after test completion.

3.19 OPENING TO TRAFFIC

- A. Newly constructed pavement shall not be opened to public traffic until all joints are sealed and the concrete has attained a flexural strength of 450 psi or a compressive strength of 3,000 psi, as determined by breaking test cylinders cured in the field in a manner that replicates as closely as possible the curing conditions of the pavement. The Contractor shall erect and maintain suitable barricades and lights to protect the pavement from traffic. Any part of the pavement damaged from traffic or other causes occurring prior to the acceptance of the pavement shall be repaired to the satisfaction of the Architect at the Contractor's expense.

END OF SECTION

SECTION 32 1723 – PAVEMENT MARKING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols, and curb markings.
- B. Reference Standards:
 - 1. MPI (APL) – Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
 - 2. FHWA MUTCD – Manual of Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration; <http://mutcd.fhwa.dot.gov>; current edition.

1.02 SUBMITTALS

- A. Submit manufacturer's data sheet for each product to be used that includes, at a minimum, the following information:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.
- B. Store products per manufacturer's recommendations in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.04 FIELD CONDITIONS

- A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Line and Zone Marking Paint: MPI No. 32 Traffic Marking Paint; color(s) as indicated.
 - 1. Parking Lots: White or Yellow.
 - 2. Handicapped Symbols and Parking Spaces: Blue.
- B. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Clean surfaces thoroughly prior to installation. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
- D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application. After cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.
- E. Establish survey control points to determine locations and dimensions of markings. Provide templates to control paint application by type and color at necessary intervals.
- F. When required, apply temporary markings of the color(s), width(s), and length(s) as indicated or directed.
 - 1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
 - 2. At Contractor's option, temporary marking tape may be used in lieu of temporary painted marking. Remove unsatisfactory tape and replace with painted markings at no additional cost to the Owner.

3.03 INSTALLATION

- A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.
- B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50° F or more than 95° F, or per the manufacturer's recommendations. Follow the more stringent requirement for application.
- C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.
- D. Comply with FHWA MUTCD manual (<http://mutcd.fhwa.dot.gov>) for details not shown.
- E. Apply markings in locations determined by measurement from survey control points.
- F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on the drawings with true, sharp edges and ends.
 - 1. Apply paint in one coat only.

2. Wet Film Thickness: 0.015-inch, minimum.
 3. Width Tolerance: $\pm 1/8$ -inch.
- G. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.
1. Mark the International Handicapped Symbol at indicated parking spaces.
 2. Hand application by pneumatic spray is acceptable.
- H. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 DRYING, PROTECTION, AND REPLACEMENT

- A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.
- B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.
- C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.
- D. Remove and replace markings that are applied at less than minimum material rates, deviate from true alignment, exceed length and width tolerances, or show light spots, smears, or other deficiencies or irregularities.
- E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.
- F. Remove and replace unacceptable markings at no additional cost to Owner.

END OF SECTION

SECTION 32 8423 - UNDERGROUND SPRINKLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and fittings, valves, sprinkler heads, emitters, bubblers, and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation: Excavating for irrigation piping.
- B. Section 31 2323 - Fill: Backfilling for irrigation piping.

1.03 REFERENCE STANDARDS

- A. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- B. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with site backfilling, landscape grading and delivery of plant life.
- B. Preinstallation Meeting: Convene one week prior to commencing work of this Section.

1.05 SUBMITTALS

- A. Product Data: Provide component and control system and wiring diagrams.
 - 1. Water regulators.
 - 2. Water hammer arresters.
 - 3. General-duty valves.
 - 4. Control-valve boxes.
 - 5. Sprinklers.
 - 6. Controllers, include wiring diagrams.
 - 7. Control cables, include splice kits.
 - 8. Backflow preventer.
- B. Shop Drawings: Indicate piping layout to water source, irrigation system piping (locations, types, sizes, capacities, and flow characteristics), location of sleeves under pavement, location and coverage of sprinkler heads, components (water meters, backflow preventers, valves, piping, sprinklers and devices, controls), plant and landscaping features, site structures, schedule of fittings to be used. Show wire size and number of conductors for each control cable.
- C. Operation and Maintenance Data:
 - 1. Provide instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
 - 2. Provide schedule indicating length of time each valve is required to be open to provide a determined amount of water.
- D. Maintenance Materials: Provide the following for Owner's use in maintenance of project.
 - 1. Extra Sprinkler Heads: One of each type and size.

2. Extra Valve Keys for Manual Valves: One.
3. Extra Valve Box Keys: One.
4. Extra Valve Marker Keys: One.
5. Wrenches: One for each type head core and for removing and installing each type head.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years of experience.

1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable code for piping and component requirements.

1.08 DEFINITIONS

- A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves. Piping is under pressure during flow.
- B. Drain Piping: Downstream from the circuit-piping drain valves. Piping is not under pressure.
- C. Irrigation Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves. Piping is under water-distribution-system pressure.
- D. The following industry abbreviations for plastic Materials:
 1. ABS: Acrylonitrile-butadiene-styrene.
 2. FRP: Fiberglass-reinforced plastic.
 3. PA: Polyamide (nylon) plastic.
 4. PE: Polyethylene plastic.
 5. PP: polypropylene plastic.
 6. PTFE: Polytetrafluoroethylene plastic.
 7. PVC: Polyvinyl Chlorine plastic.
 8. TFE: Tetrafluoroethylene plastic.

1.09 PERFORMANCE REQUIREMENTS

- A. Design head-to-head water-coverage irrigation system for lawns and exterior plants indicated.
- B. Location of Sprinklers and Specialties: Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards. Maintain 100 percent water coverage of turn and planting areas indicated.
- C. Provide necessary components to properly winterize the irrigation system.
- D. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties, unless otherwise indicated.
 1. Irrigation Main Piping: 200 psig
 2. Circuit Piping: 100 psig
 3. Drain Piping: 100 psig

- E. Maximum Run Time: All zones shall be run within an 8-hour time frame.
- F. All turf areas shall be on separate zone from planting beds.

PART 2 PRODUCTS

2.01 IRRIGATION SYSTEM

- A. Manufacturers:
 - 1. Rain Bird Sales, Inc: www.rainbird.com.
 - 2. Toro Company: www.toro.com.
 - 3. Weathermatic: www.weathermatic.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PIPES, TUBES, AND FITTINGS

- A. Mainline: Class 200 PVC continuously marked with manufacturer's name, class, and size.
- B. Lateral lines not under constant pressure: Flexible, 4710, non-toxic, polyethylene pipe rated for 100 psi minimum working pressure..
- C. Sleeves: Class CL160 PVC.
 - 1. Place under all concrete or asphalt paving where irrigation lines must be installed.
 - 2. Sleeve shall be twice the nominal size of the pipe being installed.
 - 3. Provide a separate 1-1/4 inch sleeve for irrigation wiring.

2.03 GENERAL-DUTY VALVES

- A. Electronic valves shall be compatible with the irrigation controller.
- B. Electronic valves shall have an electronic solenoid that is normally open.
- C. Electronic valves shall be buried underground in a valve box with a cover.

2.04 SPRINKLERS

- A. Sprinkler heads shall be fully adjustable that will provide uniform coverage over designated watering area.
- B. Rotary heads shall not have pop up spray heads on the same zone unless they are equipped with a rotary nozzle.
- C. Pop up spray heads shall be a minimum of 4-inches in height.

2.05 COMMUNICATIONS CIRCUITRY

- A. Electric control lines from each controller to the automatic valve shall be direct burial wire. Minimum size - #18. Connection shall be installed using blazing BVS1 or BVS2 connectors and be waterproof.
- B. All wire splicing shall be in a valve box.

2.06 AUTOMATIC – CONTROL SYSTEM

- A. Connect to the control system for the existing sprinkler system on-site.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that required utilities are available, in proper location, and ready for use.

3.02 PREPARATION

- A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, and structures.
- B. Layout and stake locations of system components.
- C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

3.03 TRENCHING

- A. Trench and backfill in accordance with Section 31 2316 and Section 31 2323.
- B. Trench to accommodate grade changes and slope to drains.
- C. Maintain trenches free of debris, material, or obstructions that may damage pipe.

3.04 INSTALLATION

- A. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.
- B. Mainline pipe which is under constant pressure, shall be installed with a minimum depth of cover of 18-inches. Other pipe shall be installed with a minimum cover of 12-inches.
- C. Piping shall be securely capped at the end of each day's work to prevent entrance of foreign material.
- D. Set outlets and box covers at finish grade elevations.
- E. Provide for thermal movement of components in system.
- F. Wiring shall be installed with main line piping in the same trench. At each connection to the valve 2' slack shall be provided to facilitate future service. Underground splices shall be waterproofed with the wire connectors and direct bury splice kit (3M DBY) as manufactured by 3M company.
- G. Install control tubing in accordance with manufacturer's instructions. Provide 10-inch (250 mm) expansion coil in irrigation piping at each valve to which controls are connected, and at 100-foot (30 m) intervals. Bury control tubing beside pipe.
- H. Mark valves with neoprene valve markers containing locking device. Set valve markers in pipe risers extending from top of valve to finish grade.
- I. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.

3.05 FIELD QUALITY CONTROL

- A. Prior to backfilling, test system for leakage at main piping to maintain 80 psi (690 kPa) pressure for one hour.
- B. System is acceptable if no leakage or loss of pressure occurs and system self-drains during test period.
- C. Location of the irrigation system heads, piping and valves shall be marked to avoid damage by others during completion of the landscape work. Sprinkler heads shall be set plumb and level to finish grade and shall be readjusted after landscape areas are completed to assure proper operation.

3.06 BACKFILLING

- A. Backfill trench and compact to specified subgrade elevation. Protect piping from displacement.

3.07 SYSTEM STARTUP

- A. Prepare and start system in accordance with manufacturer's instructions.
- B. Adjust control system to achieve time cycles required.
- C. Adjust head types for full water coverage as directed.

3.08 CLOSEOUT ACTIVITIES

- A. Instruct Owner's personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance data as basis for demonstration.
- B. As-Built Plan: Furnish an "as-built" drawing showing sprinkler heads, valves, drains, and pipelines to scale with dimensions where required.

3.09 MAINTENANCE

- A. Provide a separate maintenance contract for specified maintenance service.
- B. Provide one complete spring start-up and a fall shutdown by installer, at no extra cost to Owner. For a period of one year from date of final acceptance of work performed under this contract, the irrigation contractor shall promptly furnish, without cost to owner, all parts and labor which prove to be defective in material and workmanship.

END OF SECTION

SECTION 32 9219 – SEEDING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Grass seeding and fertilizing.

1.02 REFERENCES

- A. FS O-F-241 - Fertilizers, Mixed, Commercial.

1.03 QUALITY ASSURANCE

- A. Seed and seeding mixture shall be free of all prohibited noxious weed seed and will not contain more than one-half of 1 percent by weight of restricted noxious weed seeds.
- B. Origin of the native seed harvest shall be limited to: North Dakota, South Dakota, northern Nebraska, eastern Wyoming, eastern Montana, western Minnesota and southern Manitoba, Canada.
- C. All seed shall be tested by a commercial seed testing laboratory within 9 months prior to the planting.
- D. The seed bags shall be delivered to the project bearing a tag which shows the following information:
 - 1. Name and address of supplier.
 - 2. Supplier's lot number for each kind of seed in the mixture.
 - 3. Origin (where grown) for each kind of seed.
 - 4. Purity and germination for each kind of seed.
 - 5. Date last tested.
 - 6. Pounds of bulk seed of each kind of seed in each bag.
 - 7. Total pounds of bulk seed mixture in each bag.
 - 8. Total pounds of pure live seed of each kind of seed in each bag.
 - 9. Total pounds of pure live seed mixture in each bag.
 - 10. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of Manufacturer.

PART 2 PRODUCTS

2.01 ACCESSORIES

- A. Fertilizer: FS O-F-241; recommended for grass, with 50 percent of the elements derived from organic sources to the following proportions: Nitrogen 20 percent, phosphoric acid 20 percent, soluble potash 10 percent.
- B. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of grass.

2.02 SEED MIXTURE

A. Irrigated Seed Mix:

<u>Grass Species</u>	<u>Percent</u>
1. Arc Kentucky Bluegrass	25%
2. Fielder Kentucky Bluegrass	25%
3. Park Kentucky Bluegrass	10%
4. Shoreline Slender Fescue	15%
5. Maxima 1 Creeping Red Fescue	15%
6. Fine-Leaf Perennial Ryegrass	10%

B. Non-Irrigated Seed Mix – Early Season:

<u>Grass Species</u>	<u>Variety</u>	<u>Percent</u>
1. Western Wheatgrass	Rodan, Rosana, Walsh, Flintlock, W.R. Poole Recovery	28%
2. Switchgrass	Dacotah, Forestburg, or Sunburst, Summer	9%
3. Green Needlegrass	Lodorm, AC Mallard, Fowler	7%
4. Sideoats Grama	Killdeer, Pierre, Butte	11%
5. Slender Wheatgrass	Revenue, Primar, Adanac, Pryor, Firststrike	15%
6. Oats	--	30%

C. Non-Irrigated Seed Mix – Late Season:

<u>Grass Species</u>	<u>Variety</u>	<u>Percent</u>
1. Western Wheatgrass	Rodan, Rosana, Walsh, Flintlock, W.R. Poole Recovery	27%
2. Switchgrass	Dacotah, Forestburg, or Sunburst, Summer	5%
3. Green Needlegrass	Lodorm, AC Mallard, Fowler	10%
4. Canada Wilde-Rye	Mandan	15%
5. Slender Wheatgrass	Revenue, Primar, Adanac, Pryor, Firststrike	14%
6. Oats	--	29%

- D. Temporary Cover Crop: Oats spread at a rate of 64 pounds pure live seed per acre

PART 3 EXECUTION

3.01 EXAMINATION

- A. Prepare subgrade in accordance with Section 31 2200.
- B. Place topsoil in accordance with Section 31 2200.
- C. Verify topsoil is spread to a smooth uniform depth over area to be seeded.
- D. Verify that prepared topsoil is ready to receive the Work of this Section.

3.02 FERTILIZING

- A. Apply fertilizer at a rate of 15 pounds/10,000 square feet to all areas requiring seeding.
- B. Apply after smooth raking of topsoil.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix thoroughly into upper 2-inches of topsoil.
- E. Lightly water to aid dissipation of fertilizer.

3.03 NORMAL GRASS SEEDING

- A. Seed shall be uniformly distributed with a turfgrass drill seeder in two approximately perpendicular passes, at a rate of 3 pounds/1,000 SF per pass.
- B. Broadcast spreaders or other approved methods may be employed in areas inaccessible to drill seeders.
- C. Immediately following seed placement, all seeded areas shall be culti-packed or rolled with a roller not exceeding 112 pounds. Avoid over-compacting soil.
- D. Do not sow immediately following rain, when ground is too dry, or during windy periods.
- E. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches.

3.04 PLANTING SEASON

- A. If seeding is required for non-irrigated areas before April 20 or between July 16 and August 9, plant a temporary cover crop. Re-seed the area with the specified seed mixture between April 20 and July 15 or after August 10 and before the ground freezes.
- B. If planting non-irrigated seed between April 20 and July 15, use the Early Season seed mixture specified.
- C. If planting non-irrigated seed after August 10 and before the ground freezes, use the Late Season mixture specified.

3.05 QUALITY CONTROL

- A. All equipment is subject to Architect's approval before it is used.
- B. Maintain seeded areas immediately after placement until final project acceptance.
- C. Provide one-year written warranty with no exceptions from date of project acceptance for replacement of barren, dead, or unhealthy seeded areas. Warranty shall cover all costs for materials and installation.

END OF SECTION