f u k u i architects

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Murray Towers Rehabilitation

2825 Murray Ave
Pittsburgh, Pennsylvania 15217

Housing Authority of the City of Pittsburgh (HACP)

412 Boulevard of the Allies,
Pittsburgh, PA 15219

Fukui Architects (FAR)

205 Ross St
Pittsburgh, PA 15219

SPECIFICATIONS

August 13, 2026

SECTION 000102
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: HACP Murray Towers, located at 2825 Murray Ave, Pittsburgh, PA 15217.

B. Architect's Project #: 2338:

C. Owner's Project Number: #04 - AMP-31, Management No. 7954 BPO 3827 .

2825 Murray Ave.

Pittsburgh, Pennsylvania 15217.

D. The Owner, hereinafter referred to as HACP

1.02 NOTICE TO PROSPECTIVE BIDDERS

A. These documents constitute a Notice of Intent to Request Proposals and a Request for Qualifications from prospective Design-Builders for the design and construction of the project described below.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 000107
SEALS PAGE

DESIGN PROFESSIONALS OF RECORD

A. ARCHITECT:

1. FUKUI ARCHITECTS

2. RA404265

3. RESPONSIBLE FOR DIVISON 01-49 SECTIONS EXCEPT WHERE INDICATED AS PREPARED BY OTHER DESIGN PROFESSIONALS OF RECORD.

B. STRUCTURAL ENGINEER:

1. PROVIDENCE ENGINEERING .

2. PE085703 .

3. RESPONSIBLE FOR 03 30 00, 04 22 00, 05 12 00, 06 17 53

B. FIRE-PROTECTION ENGINEER:

1. IAMS CONSULTING

2. PE085703

3. RESPONSIBLE FOR DIVISION 21

C. PLUMBING ENGINEER:

1. IAMS CONSULTING

2. 054899-E

3. RESPONSIBLE FOR DIVISION 22

D. HVAC ENGINEER:

1. IAMS CONSULTING

2. 054899-E

3. RESPONSIBLE FOR DIVISION 23

E. ELECTRICAL ENGINEER

1. IAMS CONSULTING

2. 054899-E

3. RESPONSIBLE FOR DIVISION 26-28

END OF SECTION

SECTION 000110
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B. 012000 - Price and Payment Procedures
C. 012500 - Substitution Procedures
D. 013000 - Administrative Requirements
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F. 014000 - Quality Requirements
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2.26 DIVISION 40 -- PROCESS INTEGRATION

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SECTION 000115
LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

1.01

A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Drawing Index Page of the separately bound drawing set titled Murray Towers Rehab, dated April 13,2026, as modified by subsequent Addenda and Contract Modifications.

END OF SECTION

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Murray Towers Rehab

B. Owner's Name: HACP.

C. Architect's Name: Fukui Architects.

D. Additional Project contact information is specified in Section 000103 - Project Directory.

1.02 CONTRACT DESCRIPTION

A. Contract Type: Multiple prime contracts, each based on a Stipulated Price as described in Document 005000 - Contracting Forms and Supplements.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Scope of demolition and removal work is indicated on drawings and specified in Section 024100.

B. Scope of alterations work is indicated on drawings.

1.04 WORK BY OWNER

A. Owner has awarded a contract for supply and installation of Access Controls, Environmental Sensors, and Security Cameras which will commence on during project construction.

B. Items noted NIC (Not in Contract) will be supplied and installed by Owner after Date of Substantial Completion. Some items include:
   1. Unit refrigerators and stoves

C. Owner will supply the following for installation by Contractor:

1.05 OWNER OCCUPANCY

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

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

C. Schedule the Work to accommodate Owner occupancy.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. 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.

1.07 WORK SEQUENCE

A. Construct Work in stages during the construction period:
   1. Stage 1: As described on Phasing/Scope/Responsibility Schedule CS2 under "Phase 1".
   2. Stage 2: As described on Phasing/Scope/Responsibility Schedule CS2 under "Phase 2".
   3. Stage 3: As described on Phasing/Scope/Responsibility Schedule CS2 under "Phase 3".
   4. Stage 4: As described on Phasing/Scope/Responsibility Schedule CS2 under "Phase 4".

B. Coordinate construction schedule and operations with Owner and Architect.

1.08 SPECIFICATION SECTIONS APPLICABLE TO EVERY CONTRACT

A. Unless otherwise noted, provisions of the sections listed below apply to every contract. Specific items of work listed under individual contract descriptions constitute exceptions.

B. Section 000103 - Project Directory.

C. Section 012500 - Substitution Procedures.

D. Section 013000 - Administrative Requirements.
E. Section 013216 - Construction Progress Schedule.
F. Section 015000 - Temporary Facilities and Controls.
G. Section 017000 - Execution and Closeout Requirements.
H. Section 017800 - Closeout Submittals.

END OF SECTION

SECTION 012000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Correlation of Contractor submittals based on changes.

E. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G702 and AIA G703, edition stipulated in the Agreement.

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

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

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

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

B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.

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

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

E. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion.
   9. Balance to Finish.
   10. Retainage.

F. Execute certification by signature of authorized officer.

G. Submit one electronic and three hard-copies of each Application for Payment.

1.04 MODIFICATION PROCEDURES

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

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

C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days.

D. Contractor may propose a change by submitting a request for change to Architect and HACP, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 016000.

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

F. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide the following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

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

1.05 APPLICATION FOR FINAL PAYMENT

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

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 017000.

END OF SECTION

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

A. Procurement Substitution Requests: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment prior to receipt of bids.
   1. Substitution Requests: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment submitted following Contract award.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

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

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

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.
         4) Description of Substitution.
         5) Reason why the specified item cannot be provided.
         6) Differences between proposed substitution and specified item.
         7) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
      d. Impact of Substitution:
         1) Savings to Owner for accepting substitution.
         2) Change to Contract Time due to accepting substitution.

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

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

1. Owner will consider requests for substitutions only if submitted at least 10 days prior to the date for receipt of bids.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Architect will consider requests for substitutions only within 30 days after date of Agreement.

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

C. Submit request for Substitution for Convenience within 14 days of discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
   1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
   2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
   3. Bear the costs engendered by proposed substitution of:
      a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

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 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Web-based project software service.

C. Electronic document submittal service.

D. Preconstruction meeting.

E. Progress meetings.

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

G. Number of copies of submittals.

H. Requests for Interpretation (RFI) procedures.

I. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 007200 - General Conditions: Dates for applications for payment.

B. Section 013216 - Construction Progress Schedule: Form, content, and administration of schedules.

C. Section 017800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.03 REFERENCE STANDARDS

1.04 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WEB-BASED PROJECT SOFTWARE SERVICE

A. Web-Based Project Software Service: Provide, administer, and use web-based project software to host and manage project communication and documentation.
   1. Include, at minimum, the following features:
      a. Project directory, including Owner, Contractor, subcontractors, Architect, Architect's consultants, and other entities involved in the project. Include names of contact persons and contact information for each entity.
      b. Access control for each entity and for each workflow process to determine each entity's digital rights to create, modify, view, and print documents.

c. Workflow planning, allowing customization of workflow for each project entity.
d. Creation, logging, tracking, and notification for project communications.
e. Tracking of project communication statuses in real time, including timestamped response log.
f. Procedures for viewing PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
g. Processing and tracking of payment applications.
h. Processing and tracking of contract modifications.
i. Creation and distribution of meeting minutes.
j. Document management for drawings, specifications, and coordination drawings, including revision control.
k. Management of construction progress photographs.
l. Mobile device compatibility.
m. Creation of data analytics reports.
n. Creation and export of editable logs for software functions. Provide Owner, Architect, and Architect's consultants with rights and ability to download logs when requested.

2. Provide up to 20 user licenses for use by Owner, Architect, Architect's consultants, and other entities involved in the project.
3. Comply with the software service's current published licensing agreements.
4. Training: Provide one-hour, web-based training session for users of software service. Further training is the responsibility of the user.
   a. Representatives of Owner are scheduled and included in this training.
5. Project Closeout: Architect determines when to terminate the software service for the project and is responsible for obtaining archive copies of files for Owner.
6. Web-Based Project Software Services: The selected service is:

3.02 ELECTRONIC DOCUMENT SUBMITTAL (OPTIONAL)

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via Email to Architect and HACP.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. It is Contractor's responsibility to submit documents in allowable format.

B. Submittal Service: The selected service is:

C. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

D. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.03 PRECONSTRUCTION MEETING

A. HACP will schedule meeting after Notice of Award.

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

C. Agenda will be per HUD 5370.
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contrac tand Architect.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

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

3.04 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at maximum bi-weekly intervals per HUD 5370.

B. Attendance Required:
1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

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

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

3.05 REQUESTS FOR INTERPRETATION (RFI)

3.06 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
1. Format schedule to allow tracking of status of submittals throughout duration of construction.
2. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.

3.07 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Design data.
3. Shop drawings.
4. Samples for selection.
5. 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 017800 - Closeout Submittals.

3.08 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 017800 - 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.

3.09 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.

3.10 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a separate transmittal for each item.
   2. Transmit using approved form.
      a. Use Contractor's form, subject to prior approval by Architect.
   3. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
   4. 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.
   5. 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.
      a. Send submittals in electronic format via email to Architect.

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

C. 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.

3.11 SUBMITTAL REVIEW

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

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

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

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

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

END OF SECTION

SECTION 013216
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule.

B. Construction progress schedule, bar chart type.

1.02 SUBMITTALS

A. General Contractor shall be responsible for preparing and coordinating overall project schedule. Each prime contractor shall be responsible for coordinating their respective schedules with the General Contractor.

B. Within 10 days after date of Agreement, submit preliminary schedule.

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

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

E. Submit updated schedule with each Application for Payment.

F. Submit in PDF format.

1.03 SCHEDULE FORMAT

A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRELIMINARY SCHEDULE

A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.02 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

D. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.

E. Provide legend for symbols and abbreviations used.

3.03 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.

B. Identify the first work day of each week.

3.04 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.

B. Evaluate project status to determine work behind schedule and work ahead of schedule.

C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.05 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.

B. Indicate progress of each activity to date of revision, with projected completion date of each activity.

C. Annotate diagrams to graphically depict current status of Work.

D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.

E. Indicate changes required to maintain Date of Substantial Completion.

F. Submit reports required to support recommended changes.

3.06 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

B. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance.

B. Testing and inspection agencies and services.

C. Control of installation.

D. Mock-ups.

E. Manufacturers' field services.

F. Defect Assessment.

1.02 TESTING AND INSPECTION AGENCIES AND SERVICES

PART 3 EXECUTION

2.01 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.

2.02 MOCK-UPS

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

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

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

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

2.03 TESTING AND INSPECTION

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

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

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

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

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

2.04 MANUFACTURERS' FIELD SERVICES

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

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

2.05 DEFECT ASSESSMENT

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

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary sanitary facilities.

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

D. Project identification sign.

1.02 RELATED REQUIREMENTS

A. Section 015100 - Temporary Utilities.

1.03 TEMPORARY UTILITIES - SEE SECTION 015100

1.04 TEMPORARY SANITARY FACILITIES

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

B. Maintain daily in clean and sanitary condition.

1.05 BARRIERS

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

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

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

1.06 FENCING

A. Provide 6 foot (1.8 m) high fence around construction site; equip with vehicular and pedestrian gates with locks.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, and ventilation.

1.02 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

1.03 TEMPORARY ELECTRICITY

A. Cost: By Contractor.

B. Contractors shall be permitted to utilize existing building power for constructions activities. If building power supply is interrupted due to construction activities, Electrical Contractor shall be responsible for providing temporary power as required to facilitate construction activities.

C. Permanent convenience receptacles may be utilized during construction.

1.04 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

1.05 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. In the event of interruption to building mechanical system, Mechanical Contractor shall be responsible for providing heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F (10 degrees C) in areas where construction is in progress or as needed to allow construction activities to progress.

1.06 TEMPORARY VENTILATION

A. Existing ventilation equipment may not be used.

B. Provide supplemental ventilation as required by OSHA to control dust from ongoing construction/demolition activities

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 015713
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

1.02 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc-Type Apparatus; 2021.

B. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2022.

C. ASTM D4533/D4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2015 (Reapproved 2023).

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2015a (Reapproved 2023).

E. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile; 2021a.

F. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017 (Reapproved 2021).

G. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.

H. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 2015.

1.03 PERFORMANCE REQUIREMENTS

A. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

C. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

D. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
   1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
   2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

E. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
   1. Control movement of sediment and soil from temporary stockpiles of soil.
   2. Prevent development of ruts due to equipment and vehicular traffic.
   3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

F. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
   1. Prevent windblown soil from leaving the project site.
   2. Prevent tracking of mud onto public roads outside site.
   3. Prevent mud and sediment from flowing onto sidewalks and pavements.
   4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

G. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
   2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

H. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
   1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.

I. Open Water: Prevent standing water that could become stagnant.

J. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Erosion and Sedimentation Control Plan:
   1. Include:
      a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
      b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
      c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
      d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
      e. Other information required by law.
      f. Format required by law is acceptable, provided any additional information specified is also included.
   2. Obtain the approval of the Plan by authorities having jurisdiction.
   3. Obtain the approval of the Plan by Owner.

C. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

D. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 MATERIALS

A. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
   1. Average Opening Size: 30 U.S. Std. Sieve (0.600 mm), maximum, when tested in accordance with ASTM D4751.
   2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491/D4491M.
   3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
   4. Tensile Strength: 100 pounds-force (450 N), minimum, in cross-machine direction; 124 pounds-force (550 N), minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
   5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
   6. Tear Strength: 55 pounds-force (245 N), minimum, when tested in accordance with ASTM D4533/D4533M.
   7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

B. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 INSTALLATION

A. Silt Fences:
   1. Store and handle fabric in accordance with ASTM D4873/D4873M.
   2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
   3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
   4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
   5. Install with top of fabric at nominal height and embedment as specified.
   6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
   7. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).

3.04 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:
   1. Promptly replace fabric that deteriorates unless need for fence has passed.

2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Clean out temporary sediment control structures weekly and relocate soil on site.

E. Place sediment in appropriate locations on site; do not remove from site.

3.05 CLEAN UP

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect.

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Re-use of existing products.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations.

E. Procedures for Owner-supplied products.

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

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Identification of Owner-supplied products.

B. Section 012500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 017419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

D. Section 230513 - Common Motor Requirements for HVAC Equipment: Motors for HVAC equipment.

1.03 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators; 2024.

1.04 SUBMITTALS

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

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

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

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

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

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

2.02 NEW PRODUCTS

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

B. Use of products having any of the following characteristics is not permitted:

1. Containing lead, cadmium, or asbestos.

C. Motors: Refer to Section 230513 - Common Motor Requirements for HVAC Equipment, NEMA MG 00001 Type. Specific motor type is specified in individual specification sections.

2.03 PRODUCT OPTIONS

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

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named or a product of equal performance.

C. Door hardware shall be Falcon type per drawings with no substitutions permitted.

D. Products Specified as Basis-of-Design: Submit substitution requests for unnamed products to Architect for evaluation.

2.04 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 012500 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 011000 - Summary for identification of Owner-supplied products.

B. 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.

C. 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 017419.

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

C. Store with seals and labels intact and legible.

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

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

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

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

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

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

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

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

END OF SECTION

SECTION 017000
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. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

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

H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

B. Section 017419 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

C. Section 078400 - Firestopping.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

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

1.04 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

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

1.05 PROJECT CONDITIONS

A. Conduct asbestos remediation in accordance with section 028000

B. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

D. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

E. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.06 COORDINATION

A. 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.

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

C. 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.

D. 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.

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

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

G. 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 016000 - 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 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

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

3.04 LAYING OUT THE WORK

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

B. Promptly notify Architect of any discrepancies discovered.

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

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

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

F. Utilize recognized engineering survey practices.

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

H. Periodically verify layouts by same means.

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

3.05 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.

3.06 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. Remove existing work as indicated and as required to accomplish new work.
1. Remove items indicated on drawings.
2. Relocate items indicated on drawings.
3. 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.
4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. 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.

D. 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.

E. 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.

F. 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.

G. Clean existing systems and equipment.

H. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

I. Do not begin new construction in alterations areas before demolition is complete.

J. Comply with all other applicable requirements of this section.

3.07 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 original 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 078400, 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.

3.08 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.

3.09 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.

3.10 ADJUSTING

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

3.11 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

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

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

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

E. Clean filters of operating equipment.

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

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

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

3.12 CLOSEOUT PROCEDURES

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

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

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

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

E. Owner will occupy all of the building as specified in Section 011000.

F. 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.

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

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

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

3.13 MAINTENANCE

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

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

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

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

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

END OF SECTION

SECTION 017419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Each prime contractor shall be responsible for removing their respective construction/demolition waste.

B. General contractor shall be responsible for procuring and maintaining project dumpsters sufficient to serve the entire project. GC shall be responsible for providing and maintaining additional demolition infrastructure as needed including trash chutes, scaffolding, and pedestrian protection covers.

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

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

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

F. 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.

G. 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 024100: Procedures for hazardous material removal.

B. Section 013000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. Section 015000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

D. Section 016000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

E. Section 017000 - 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.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
      c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   4. Incinerator Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
      c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
      d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   5. Recycled and Salvaged Materials: Include the following information for each:
      a. Identification of material, including those retrieved by installer for use on other projects.
      b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.
      c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards (cubic meters).
   c. Include weight tickets as evidence of quantity.
7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 013000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 015000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 016000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 017000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

END OF SECTION

SECTION 017800
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 007200 - General Conditions and 007300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

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. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   2. 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.
   3. 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 3 EXECUTION

2.01 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. Changes made by Addenda and modifications.

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

2.02 OPERATION AND MAINTENANCE DATA

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

B. 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.

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

2.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. 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.

2.04 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.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

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

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

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

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures; except:
   1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Provider.
   2. Submit one copy to the Commissioning Provider, not to be returned.
   3. Make commissioning submittals on time schedule specified by Commissioning Provider.
   4. Submittals indicated as "Draft" are intended for the use of the Commissioning Provider in preparation of overall Training Plan; submit in editable .rtf or .docx electronic format unless otherwise approved.

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

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

1.03 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DEMONSTRATION - GENERAL

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

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

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

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

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

3.02 TRAINING - GENERAL

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

B. Conduct training on-site unless otherwise indicated.

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

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

E. Provide training in minimum two hour segments.

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

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

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

I. Product- and System-Specific Training:
   1. Review the applicable O&M manuals.
   2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
   3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
   4. Provide hands-on training on all operational modes possible and preventive maintenance.

5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

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

END OF SECTION

SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Selective demolition of building elements for alteration purposes.

C. Abandonment and removal of existing utilities and utility structures.

1.02 RELATED REQUIREMENTS

A. Section 003100 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 011000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 011000 - Summary: Sequencing and staging requirements.

D. Section 011000 - Summary: Description of items to be removed by Owner.

E. Section 011000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

F. Section 017000 - 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.

G. Section 312200 - Grading: Rough and fine grading.

H. Section 312323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

I. Section 329300 - Plants: Relocation of existing trees, shrubs, and other plants.

J. Section 329300 - Plants: Pruning of existing trees to remain.

K. Section 02-8000: hazardous material abatement.

1.03 DEFINITIONS

A. Demolish: Dismantle, raze, destroy, or wreck any building or structure or any part thereof.

B. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

C. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.04 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).

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

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

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

PART 3 EXECUTION

2.01 DEMOLITION

A. Remove portions of existing building as indicated by Demolition Plans

B. Remove paving and curbs required to accomplish new work.

C. Remove other items indicated, for salvage, relocation, and recycling.

D. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 312200.

2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 017000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   3. Provide, erect, and maintain temporary barriers and security devices.
   4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   5. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
   6. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
   7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

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

D. 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.

E. 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.

F. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

2.03 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.

2.04 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. Remove existing work as indicated and required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services including, but not limited to, HVAC, Plumbing, and Electrical: Remove existing systems and equipment as indicated.
   1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
   2. Verify that abandoned services serve only abandoned facilities before removal.
   3. 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.

D. 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.

2.05 DEBRIS AND WASTE REMOVAL

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

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

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

END OF SECTION

SECTION 028000
– ASBESTOS ABATEMENT

SECTION 02 8000 – ASBESTOS ABATEMENT

PART 1 GENERAL

2.01 REFERENCE STANDARDS

A. 29 CFR 1926.1101 - Asbestos; Current Edition.

2.02 STIPULATIONS

A. References herein to “Contractor”, “Asbestos Abatement Contractor” or “AAC” refer to the properly certified personnel employed directly under the General Construction Contract.

B. The procedures specified in this section are for minimum performance. Variations to the stipulated work procedures will only be accepted through written approval by Professional Service Industries, Inc. (PSI), an Intertek company. The AAC is responsible for conformance to regulatory codes, rules and guidelines. The AAC is required to obtain all permits, licenses and approvals to perform the work, including any rights to use patented systems.

1.02 SCOPE OF WORK

A. A survey for asbestos-containing materials (ACM) was conducted on March 7, 2016 and June 10, 2024 at Murray Towers located at 2825 Murray Avenue, Pittsburgh, Pennsylvania, by PSI and a survey report prepared by accredited individuals. The survey report was used to identify the types and general locations of ACMs within the building.

B. The work includes removal and disposal of Floor tile and mastic, mastic associated with Non-ACM Floor Tile and, acoustical texture ceiling.

C. The scope of work for this project covers the filing of required notifications, landfill charges, supplying of all labor, tools, materials, equipment, services and appurtenances to accomplish the work below. The work shall be performed to the complete satisfaction of the Housing Authority City of Pittsburgh (Owner), Owners Representative, and the Environmental Consultant in accordance with the current Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) regulations, the Pennsylvania Department of Labor and Industry (PA DL&I), the Department of Environmental Protection (DEP), and the Allegheny County Health Department (ACHD) regulations and any other applicable Federal, State and Local Government regulations. The AAC should perform the abatement in accordance with the most stringent of the regulations provided.

D. There must be at least three (3) state licensed workers/supervisors present and working at all times during the scheduled shifts. The AAC must have written approval from the Environmental Consultant and the Owner to use less than five certified workers for a specific reason. In addition, sufficient manpower must be provided to maintain the overall project schedule.

E. Submit required documentation in accordance with Owners “Submittal Procedures”. Copy all communication to Owner and Environmental Consultant.

1. SDS Submittals will not be acted upon by Owner but may be accepted as Information Submittals.
    a. The determination of the exact amount of asbestos-containing materials present is solely the responsibility of the AAC.
    b. Work under this project includes, but is not limited to, the following Proper Removal and Disposal of the following asbestos-containing materials:

Material Description	Material Locations	Estimated Quantity
12” x 12” Floor Tile and Mastic	Throughout All Units excluding bathroom	540 SF per Unit

Material Description	Material Locations	Estimated Quantity
Black Mastic Associated with Non ACM Floro Tile	3rd Floor Community Room	1,000 SF
Floor Tile and Mastic Under Non ACM 12” Floor Tile	3rd Floor Laundry Room	200 SF
Acoustical Ceiling Texture (on concrete decking)	2nd – 8th Floor All Units	370 SF per Unit
	2nd – 8th Floor Hallways	2,000 SF per Hallway
	3rd Floor Laundry Room	200 SF

1) These quantities are estimated quantities. Demolition/Abatement shall be responsible for conduction their own site survey prior to submission of the bid to verify quantities of hazardous materials to be removed.

F. AAC shall be responsible for removing and disposing any and all fixed furniture, cabinets, mechanical or electrical equipment, etc. to access ACMs. Coordinate with the GC if disconnects to mechanical or electrical equipment are required to access ACMs.

G. All loose furnishings and fixtures in the work areas will be removed by the owner prior to abatement activities. Coordinate with Owner if there are remaining or additional items that need removed from the work areas.

H. The AAC is to include in the bid price and supply all means necessary to access ACMs (i.e. demolition, scaffolding, aerial lifts, etc.).

1.03 CONTROL OF WORK

A. Work which does not conform to the requirements of the contract, plans and specifications will be considered unacceptable.

B. Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be corrected immediately to an acceptable condition.

C. If the Owner or Environmental Consultant finds the materials furnished, work performed, or the finished product not within conformity with the contract documents and have resulted in an unacceptable finished product, the affected work or material shall be corrected by and at the expense of the Contractor.

1.04 QUALITY ASSURANCE

A. Independent testing agency:

1. AAC to coordinate with Environmental Consultant whose purpose will be to establish ambient levels of airborne fibers before, during, and after abatement activities, and to detect faults in the work area isolation that might result in the contamination of the building with airborne asbestos fibers caused by the failure of the air exhausting system or rupture in the containment barriers. The Environmental Consultant will ensure that all work is performed in compliance with OSHA, EPA, and ACHD standards and regulations.
2. Airborne fibers referred to above include all fibers regardless of composition as counted by phase contrast microscopy (PCM) in accordance with NIOSH 7400 Procedure. Should the PCM air monitoring detect either a fault in the work area isolation or visible emission, the AAC shall immediately cease asbestos abatement activities until the fault is corrected. Work shall not recommence until authorized by the Environmental Consultant.
3. Any result greater than 0.01 fibers per cubic centimeter (f/cc) collected by an air sample outside the work area shall be considered as evidence of a fault in the work area isolation. The AAC shall strive to maintain the asbestos concentration inside the work area equal to or less than 0.2 f/cc by engineering and work practice controls. It is recognized that there may be situations when this is not feasible. At the discretion of the Environmental

Consultant, levels may exceed 0.2 f/cc, but not 0.5 f/cc. Additional engineering and work practice controls shall be implemented by the AAC should any result from an air sample collected inside the work area exceed 0.5 f/cc.

4. Excessive Airborne Fiber Counts: The following procedures shall be used to resolve any dispute regarding fiber type when a project has been stopped due to excessive airborne fiber counts. Samples will be taken and analyzed by transmission electron microscopy (TEM) utilizing NIOSH 7402 Method by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory.
5. Personnel Air Samples: The AAC is responsible for monitoring its personnel in accordance with OSHA regulations 29 CFR 1926.1101 and mandatory appendices.
6. Asbestos abatement work shall be considered to be substantially complete upon confirmation of final air clearance by the Environmental Consultant and passing a visual clearance inspection performed by the ACHD.

B. Contractor Experience:
1. The AAC shall have a minimum of two (2) years of experience in the asbestos abatement business and shall have successfully completed three (3) projects of similar or larger size and dollar value to this project and shall not have defaulted on an asbestos abatement project within the last two (2) years. The AAC shall furnish documentation of these projects, including names and addresses of the purchaser of the service and the location of the work performed.
2. The AAC shall be certified by the Pennsylvania Department of Labor and Industry and the ACHD. The AAC certification number must be provided to the Owner in its bid.
3. The AAC shall provide a list of any outstanding violations received from OSHA, the EPA, ACHD, or any applicable State and Local Governing body that occurred within the two (2) years.

C. Worker Certification:
1. Furnish proof that its employees have had instructions on the dangers of asbestos exposure, on respirator use, decontamination, and current OSHA and EPA regulations. Proof of training is to be provided to the Environmental Consultant prior to commencement of abatement activities.
2. Documentation of workers medical exams, consisting of x-rays and pulmonary function shall be submitted to the Environmental Consultant prior to any work being performed and as may be required by current OSHA and EPA regulations and any applicable State and Local Government regulations.
3. There must be on site at all times during abatement activities, an EPA Certified Asbestos Abatement Supervisor. The Asbestos Abatement Supervisor shall have successfully completed an EPA Certified Practices and Procedures Course as per 40 CFR, Part 763, Subpart E, Appendix C-EPA Model Accreditation Part (must provide a copy of certificate from EPA approved course). All asbestos workers shall have successfully completed an EPA Certified Practices and Procedures Course as per 40 CFR, Part 763, Subpart E, Appendix C-EPA “Model Accreditation Plan”. The Contractor must provide copies of current certificates from Pennsylvania Department of Labor and Industry for all workers and supervisors.
4. The Abatement Supervisor and Abatement Workers shall be licensed by the PA DL&I. Each worker/supervisor shall have photo identification issued by PA DL&I available at the work site.

1.05 POSTING OF REGULATIONS

A. The AAC will have at all times in his possession at its office one (1) copy and on view at the job site one (1) copy, current OSHA Regulations 29 CFR 1926.1101, Asbestos, and current Environmental Protection Agency 40 CFR Part 61, Subpart N: National Emission Standard for Asbestos, Asbestos Stripping Work Practices and Disposal of Asbestos Waste.

1.06 CODES AND REGULATIONS AND REGULATORY AGENCIES SUBMITTALS (AAC'S RESPONSIBILITY)

A. Except to the extent that more explicit or more stringent requirements are written directly into the contract documents, all applicable codes, regulations, and standards have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith.

B. The following codes and regulations govern asbestos abatement work, asbestos waste material, hauling and disposal, employee health and safety, and environmental protection:
   1. U.S. Department of labor, OSHA, including but not limited to:
      a. Occupation Exposure to Asbestos, Title 29, Part 1910, Section 1001 and Part 1926, Section 1101 of the Code of Federal Regulations.
      b. Respiratory Protection, Title 29, Part 1910, Section 134 of the Code of Federal Regulations.
      c. Training and Work Practices, Title 29, Part 1926, Section 26 of the Code of Federal Regulations.
      d. Employee Exposure and Medical Records, Title 29, Part 1910, Section 20 of the Code of Federal Regulations.
      e. Specifications for Accident Prevention Signage and Label, Title 29, Part 1910, Section 145 of the Code of Federal Regulations.
   2. U.S. Environmental Protection:
      a. Regulations for Controlling Visible Emissions, National Emission Standard for Asbestos, Title 40, Part 61, Subpart M of the Code of Federal Regulations.
      b. Guidelines for Disposal of Solid Waste, Title 40, Part 241 of the Code of Federal Regulations.
      c. Criteria for Classification of Solid Waste Disposal Facilities and Practices, Title 40, Part 257 of the Code of Federal Regulations.
   3. U.S. Department of Transportation
      a. Hazardous Material Regulations, Title 49, Part 107 of the Code of Federal Regulations.
   4. Commonwealth of Pennsylvania, Bureau of Occupational and Industrial Safety
      a. Pennsylvania Act 194, Asbestos Occupations Accreditation and Certification Act.
   5. Pennsylvania Department of Environmental Protection
      a. Asbestos Regulations, Title 25, Part 1, Subpart C
   6. Allegheny County Health Department
      a. Rules and Regulations, Article XXI, Air Pollution Control

C. Notify the following agencies in writing ten (10) days prior to starting work for notification and instructions concerning proper disposal of asbestos waste material. Copies of all notifications shall be sent to the Owner and the Environmental Consultant.
   1. Pennsylvania Department of Environmental Protection
      1) Bureau of Air Quality Control
      b. P.O. Box 8468
         1) Harrisburg, Pennsylvania 17105-8468
   2. Allegheny County Health Department
      1) 301-39th Street, Building 7
      2) Pittsburgh, Pennsylvania 15201

1.07 AIR MONITORING

A. Air sampling of work areas and surrounding environment will be conducted during the performance of this contract by the Environmental Consultant so as to ensure compliance with all codes, regulations, ordinances and these specifications.

B. AAC shall fully cooperate with the Environmental Consultant and all others responsible for testing and inspecting the work. An air testing and monitoring schedule shall be submitted prior to the start of work.

C. Air testing and analysis shall be in accordance with current EPA and requirements of Section 29 CFR 1926.1101 of the current OSHA Regulations, as a minimum. Analysis shall be performed by Phase Contrast Microscopy (PCM) per NIOSH 7400 Method analytical procedures and/or Transmission Electron Microscopy (TEM) per EPA Level II analytical procedures.

D. Air tests taken prior to start of work (background), during abatement activities (areas and personals) and upon completion of removal activities (finals) will be analyzed by PCM.

E. After a work area has passed the Environmental Consultant's visual inspection, final clearance testing will be performed no sooner than 24 hours later.

F. The Environmental Consultant shall give verbal notification to the Owner of the final clearance results of each test within 24 hours of the time the samples were analyzed. The Environmental Consultant shall confirm the results in writing within three (3) days thereafter.

G. Prompt reports are necessary so that, if required, modifications to work methods and/or practices may be implemented as soon as possible, if such action is required.

H. Representatives of the Environmental Consultant shall have access to the work area at all times. Provide facilities for such access in order that the Environmental Consultant may properly perform its function.

I. Specimens and samples for testing shall be taken by the testing personnel. Sampling equipment and personnel will be provided by the Environmental Consultant. Air sampling shall be performed in each work area prior to commencement of the work at the location. The highest fiber count reading during pre-clearance clean-up monitoring shall be lower than the background readings established by pre-job monitoring or 0.01 f/cc, whichever is lower.

J. Air sampling shall be taken on, but not necessarily limited to, the following schedule:

AREA	WHEN	NUMBER OF SAMPLES (MINIMUM)	VOLUME SAMPLE (LITERS)	MINIMUM COLLECTION RATE (LITERS/MIN)
WORK AREA (PCM)	**PRIOR TO JOB START**	**5**	**1500**	**2-10**
WORK AREA (PCM)	**DURING AREA ISOLATION**	**DAILY1**	**1000**	**2-10**
WORK AREA (PCM)	**DURING ABATEMENT WORK**	**DAILY1**	**1000**	**2-10**
WORK AREA (PCM)2	**DURING ABATEMENT WORK**	**DAILY2**	**1000**	**2-10**
WORK AREA (PCM) (<160 SF, 260 LF)	**AT COMPLETION (FINAL)**	**3**	**1500**	**10-12**
WORK AREA (PCM) (>160 SF, 260 LF)	**AT COMPLETION (FINAL)**	**5**	**1500**	**10-12**

NOTES:

1. 1 Consecutive daily air samples will be taken during abatement to yield a minimum of eight (8) hours of sampling time for each active work area.

2. 2 Exterior samples shall be taken at all decontamination unit entrance, waste load out exit, and discharge of HEPA exhaust units.

B. Work area clearance testing shall be completed before work site protective barriers are removed.

C. AAC is responsible for performing the thirty (30) minute excursion air sampling per OSHA Regulations.

D. AAC is responsible for performing personal air samples in the employees breathing zone per OSHA regulations.

1.08 AIR FILTERING

A. An approved pressure/air movement atmosphere may be created in the active work area using HEPA equipped air movement units.

B. Air may be drawn from clean areas through the decontamination and active work areas, HEPA filtered and exhausted through air movement units to the containment exterior. Replace filters in accordance with manufacturer's instructions.

C. Air movement should be sufficient quantity to ensure a minimum of four (4) air changes per hour.

1) example: Active work area = 50' x 50' x 20' = 50,000 cu. ft.
2) For four air changes per hour = 4 AC/HR x 50,000 CF/AC = 2000,000 cu. ft./hr.
3) In cubic feet per minute = 200,000 CF/HR: 60 min./hr. = 3,333 cu. ft./minute

D. The exhaust system must be sufficient to maintain a minimum pressure differential of -0.02 inches (0.51 mm) of water relative to unsealed, adjacent area. Provide continuous, 24-hours per day monitoring of the pressure differential with an automatic recording instrument.

E. The exhaust system(s) will run twenty-four (24) hours/day until final clearance is obtained and will be maintained in accordance with ANSI Z9.2 and the manufacturer’s directions.

F. To ensure continuous operation, provide a spare negative exhaust unit available.

1.09 ALTERNATIVE AIR FILTERING METHODS

A. Other approved air filtering methods may be utilized with the stipulation that designed regulatory agencies provide documented approval to the Owner and the Environmental Consultant. It shall be the responsibility of the AAC to submit all documentation required to the appropriate regulatory agency for their review and approval.

1.10 PLACEMENT OF WARNING SIGNS AND LABELS

A. Warning Signs and Labels: Provide warning signs at all approaches to asbestos control areas containing concentrations of airborne asbestos fibers. Locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. Provide labels and affix to all asbestos materials, scrap waste, debris and other products contaminated with asbestos.

1. Warning Signs: Provide warning signs conforming to 29 CFR 1926.1101 with the following legend:

DANGER

ASBESTOS

CANCER AND LUNG DISEASE HAZARD

AUTHORIZED PERSONNEL ONLY

RESPIRATORS AND PROTECTIVE CLOTHING ARE

REQUIRED IN THIS AREA

1. Provide spacing between lines at least equal to the height of the upper of any two lines.

B. Caution Labels: Attach label to each disposal bag and container, displaying the following legend:

DANGER

CONTAINS ASBESTOS FIBERS

AVOID CREATING DUST

CANCER AND LUNG DISEASE HAZARD

A. Identification Label: Attach label to inner opaque or colored disposal bag so that it remains visible through the clear outer bag. Attach labels to container transported from facility site. Text shall include the following legend:
   1. Waste Generator Name:
   2. Generator Location:

B. Transportation Marking: In accordance with 49 CFR 107, provide marking on all containers with more than one pound of friable asbestos, as follows:

NA2212

RQ ASBESTOS

PGIII

CLASS 9

PART 2 - PRODUCTS

2.01 EQUIPMENT AND MATERIALS

A. The list of required materials will include, but is not necessarily limited to the following:
   1. Respirators: Provide respiratory protection in accordance with OSHA Regulation 29 CFR 1926.1101 and ANSI Z88.2-1980. Respiratory protection shall be as listed below. There shall be NO EXCEPTION to this requirement. No employee or visitor shall enter the area without this protection until all visible asbestos has been removed from this area. Employees or visitors shall wear this type respirator. Respirators shall be NIOSH/MSHA approved.
   2. Protective Clothing: Provide only disposable protective clothing with material composition of layered polypropylene or spunbonded polyethylene nonwoven material. Disposable protective clothing is to be worn once and disposed of as asbestos-contaminated waste upon exiting from the work area. Suits shall have zipper front and attached hood and shoe covers. “Tyvek" by DuPont, or approved equal are acceptable disposable coveralls. Gloves will be worn for hand cover as required.
   3. Wetting Agents: The asbestos material will be sprayed with water containing an additive to enhance penetration. The additive, or wetting agent, will be polyoxyethylene at a concentration of one (1) ounce per five (5) gallons of water, or equal. A fine spray of this solution must be applied to prevent fiber disturbance preceding the removal of the asbestos material. The asbestos will be sufficiently saturated to prevent emission of airborne fibers in excess of the exposure limits prescribed in the current OSHA standards referenced in these specifications. Dry removal will not be allowed except with written approval.
   4. Polyethylene sheeting: Actual thickness must be six (6) mils, for vertical protection (walls, doors, windows) and for all other uses (floors, fixed equipment, HVAC supply and return openings). Industry Standard “6 mil (0.1524 mm)” sheet is not acceptable.
   5. Polyethylene bags (with warning labels) six mil (.006") minimum for disposal. All asbestos that is removed shall be double bagged.
   6. Tape: High quality vinyl or fabric duct tape.
   7. Negative Pressure Filtration Equipment: Air movement and filtering equipment equipped with HEPA filters rated at 99.97% removal down to 0.3 microns, and of sufficient capacity to provide a minimum of four (4) air changes per hour for each active work area.
   8. Airless Spray Equipment: Electric airless spray equipment for saturating and mist fiber control. Low-pressure 500 psi (3447.38 kPa) equipment must be available on-site and utilized as required.

9. Vacuum: HEPA rated for surface cleaning and housekeeping. Hand operated and power tools such as, but not limited to, saws, scorers, abrasive wheels and drills should be provided with local exhaust ventilation systems with HEPA filters.
10. Hand tools: Brooms, plastic shovels, scrapers, brushes, etc., in sufficient quantity to ensure the appropriate level of housekeeping.
11. Water Filtration System: Shower and contaminated water filtration system.
12. GFI Equipment: All electrical connectors in the work area must be through "ground fault" protected outlets/circuits.
13. Flooring Removal Machine: Infrared heat unit with HEPA filtration/purification system.
14. Shot blasting methods are to be utilized for this project for flooring adhesive removal.
15. Penetrating Encapsulant: Penetrating encapsulants to be used on this project are International Cellulose Corporation SK-13 Asbestos Encapsulant, International Protective Coatings Corporation Serpiflex Shield, Fiberlock Technology ABC Asbestos Binding Compound Concentrate, and others listed as acceptable in the Environmental Protection Agency - Battelle Laboratory Encapsulant Study, or approved equal.
16. SDS for all materials shall be submitted to Independent testing agency and kept on site.

2.02 PERSONNEL PROTECTION

A. Personnel protection is required for laborers, mechanics, supervision and visitors at the work site during the set-up and abatement operations.

B. Each worker shall be supplied with a minimum of two (2) complete protective work clothes and respirator filter changes per day for the complete duration of the project. Hard hats should be available as appropriate which meet ANSI Z-89.1 standards. Safety toe footwear is to be worn underneath the disposable or recyclable shoe coven and must meet the requirements and specifications in ANSI Z-41-1. Eye wear and face protection must meet the standards and specifications of ANSI Z-87.1.

C. In addition to sets of protective work clothes for workers, the Contractor shall have on hand two (2) additional sets of disposable work clothes per day for personnel who are authorized to inspect the work site. Hard hats should be available as appropriate which meet ANSI Z-89.1 standards. Safety toe footwear is to be worn underneath the disposable or recyclable shoe covers and must meet the requirements and specifications in ANSI Z-4 I-1. Eye wear and face protection must meet the standards and specifications of ANSA Z-87.1.

D. Respirators approved for asbestos use and protective work clothes will be worn by laborers and mechanics as a minimum during set-up operations (plastic draping, light-fixture dropping or removal, etc.).

E. Appropriate respirators will be worn by all personnel in the active work area.

F. Upon leaving the active work area, filters will be discarded, cartridges removed and respirators cleaned in disinfectant solution and clean water rinse.

G. Clean respirators will be stored in plastic bags when not in use.

H. Respirators will be inspected daily for broken, missing, or deteriorated parts.

PART 3-EXECUTION

31.01 3.01 AREA PREPARATION

A. Prior to starting the abatement, provide to the Owner and the Environmental Consultant the intended methods for set-up and abatement. Issues to be covered must include type of containment, location of decontamination chambers, method to remove ACMs, safety data sheets (SDS) of any solvents to be used, landfill to be used for disposal of asbestos-containing materials, and a schedule for project completion.

B. Temporary Electrical Services within Containment Area: As required, coordinate with the Owner’s access and connection to temporary power and arrangements for temporary lighting. Ensure safe use of temporary power sources and equipment in compliance with the requirements of the UL Code. Provide ground fault circuit interrupters (GFCI) for all equipment

and utility circuits. All extension cords shall be grounded. See Section 01 5000 and Division 26.

C. Plumbing and Sanitary Services within Containment Area: Provide for temporary water from existing building sources to control the generation of airborne dust, to allow for area, personnel, and equipment decontamination, and to supply decontamination unit needs. Also, provide for temporary sanitary drainage piping to decontamination unit sump at a minimum slope of 2.0%, and temporary drainage piping to waste water pump and existing drain in accordance with local standards.

D. Isolate the work area for the duration of the work by installing critical barriers completely sealing off all openings in the work area, including, but not limited to, heating ventilation ducts, doorways, corridors, windows, roof ventilator openings, and wall vents, with plastic sheeting taped securely in place.

E. Under no circumstances will the AAC allow any containment areas to be broken.

F. Provide decontamination chamber(s) to be connected to each active work area for entrance to or exit from the active work area. When required a separate material load-out unit shall be provided.

3.02 DECONTAMINATION CHAMBER (USAGE AND ACTIVITIES)

A. Outside room (clean room). In this room the worker leaves all street clothes and dresses in clean working clothes. Respiratory protection equipment is also picked up in this area. No asbestos contaminated items should enter this room. Workers enter this room either from outside the structure dressed in street clothes, or naked from the showers, after showering.

B. Shower Room: This is a separate room used for transit by cleanly dressed workers entering the job from the outside room or by workers headed for the showers after undressing in the equipment room.

C. Equipment Room (contaminated area): Work equipment, footwear and additional contaminated work clothing are left here. This is a change and transit area for workers.

D. Decontamination facilities require temporary utility services. Verify during bidding period the availability for temporary hook up. Mobilization, hook-up and demobilization, disconnection costs will be the responsibility of the Contractor. Installation of temporary services during demolition shall be per current EPA and OSHA regulations.

E. Work Area: The work area should be separated by polyethylene barriers from the equipment room. If the airborne asbestos level in the work area is expected to be high, as in dry removal an additional intermediate cleaning space may be added between the equipment room and the work area. Isolation of the work areas, as required, is necessary to prevent contamination and fiber dispersal to other areas of the building during work and clean-up operation. Air movement will flow uninterrupted from outside the work area through the change and equipment moms into the active work area. It is then HEPA filtered and exhausted to the building exterior.

3.03 WORK AREA ENTRANCE/EXIT

A. All workers involved in the removal of asbestos will utilize the following procedure for work area entrance and exit.

B. The worker enters outside room and removes clothing, puts on clean uniform, gloves and respirator. Gloves will be taped to uniform sleeves and boots taped to coverall legs. Uniforms will be taped closed at neck, zipper seams, wrists and ankles.

C. Any additional clothing and equipment left in dirty room required by the worker is put on. (When the work area is too cold for coveralls only, worker will usually provide himself with additional warm garments. These must be treated as contaminated clothing and left in the decontamination area.)

D. Worker proceeds to work area.

E. Before leaving the work area, the worker shall remove all gross contamination and debris from the coveralls, by vacuuming down the clothes with a vacuum cleaner with a HEPA filter. In practice, this is carried out by one worker assisting another.

F. The worker proceeds to equipment room and removes all clothing except respiratory protection equipment. Extra work clothing may be stored in contaminated end of the area.

G. Disposable coveralls are placed in a bag for disposal with other material. The worker then proceeds into the shower room. Respiratory protection equipment should only be removed after wetting in shower to prevent inhalation of fibers. Ensure that employees shower daily before entering the clean room.

H. After showering, the worker moves to the clean room and dresses in either new coveralls for another entry or street clothes if leaving.

I. Respirators are picked up, washed and wrapped by protected workers. The respirators are then brought to the clean room by an outside worker.

J. Workers shall not eat, drink, smoke, chew gum, or chew tobacco in the work area. To eat, drink or smoke, workers shall follow the decontamination procedure outlined above.

K. All footwear shall be left inside work area until completion of the job, then cleaned or discarded.

3.04 METHOD OF REMOVAL

A. Remove and dispose of all asbestos-containing materials in accordance with the more stringent methods and procedures as outlined in the United States Department of Labor, OSHA Asbestos Regulations, Codes of Federal Regulations Title 29, Part 1926, Section 1926.1101 or as are written directly into the contract documents.

B. Dry removal will not be allowed except when wet removal will create a safety hazard. Dry removal process will require written authorization by the USEPA.

C. Work of this section shall be performed in the following manner:
   1. Eliminate airflow into containment area by isolating all supply and return air ducts from mechanical system. Turn off electrical power.
   2. Install six (6) mil polyethylene critical barriers over all windows, doors, wall openings, ceiling openings, electrical outlets, ventilation points of entry/exit, etc. Secure with duct tape on all sides.
   3. Six (6) mil polyethylene protecting ceiling surface from wall to wall, where needed.
   4. Isolation barriers separating occupied areas and work areas shall be framed and covered with ½ inch plywood and two (2) layers of six (6) mil polyethylene.
   5. Duct HEPA filter unit through window. Locate unit to prevent dead air pockets.
   6. Install triple air curtain, six (6) mil polyethylene (typical), over door opening into decontamination unit or load out unit
   7. Utilize wet methods with amended water
   8. ACM waste must be removed and disposed of by the end of each work shift.
   9. Removal of Asbestos Containing Flooring, Floor Tile and Mastic
      a. Demolition of building systems, components, and/or fixtures may be necessary to access ACMs.
      b. Establish negative pressure, full containment, critical barrier containment or mini containment, depending on the mastic removal procedure.
      c. Cut carpeting (if present) into manageable sections. If asbestos floor tile or mastic adheres to the carpeting, roll up carpeting, tape to secure, wrap in 2 layers of 6-mil polyethylene sheeting, and dispose of as ACM. If floor tile and/or mastic does not adhere to the carpeting, the carpet can be disposed of as general construction debris.
      d. Remove asbestos tile mastic and/or contaminated underlayment's or vapor barriers by suitable means (e.g., scrapers) and wet methods. Remove the tile without breakage. Place tile into a polyethylene lined fiberboard box or double (6) mil disposal bag. Seal box and place in disposal bag. HEPA vacuum the floor substrate and any remaining loose dust and debris generated by removal activities.

e. Remove tile adhesive using a surface milling machine consisting of a shot blasting device utilizing steel abrasive shot and a separate dust collector vacuum device equipped with a HEPA filtration system under a full containment or using a solvent adhesive remover under a critical barrier containment with splash guards.
f. The Environmental Consultant may test for complete removal of adhesive. Concrete will be scraped to detect adhesive residue. Concrete will be considered bare, if no adhesive residue is visible on the scraper.
g. Accumulate all loose material for disposal. Wet wipe all wall, floor, ceiling and horizontal surfaces.
h. The Environmental Consultant, Professional Service Industries, Inc. (PSI), shall inspect for complete removal of all materials. The contractor shall re-clean and dispose of any asbestos-containing material identified.

10. Removal Acoustical Texture Ceiling
    a. Establish negative pressure, full containment.
    b. All insulation materials and contaminated surfaces shall be wetted with amended water, manually removed, and immediately double bagged or wrapped for disposal.
    c. Manually remove ACM insulation by suitable mechanical means (e.g., scrapers, knives, etc.). Place ACMs into a polyethylene lined fiberboard box or double 6 mil (0.1524 mm) disposal bags immediately after removal. Do not allow ACM to accumulate on the floors.
    d. Accumulate all loose material for disposal. Wet wipe all wall, floor, ceiling and horizontal surfaces.
    e. The Owner or Owner's Consultant shall inspect for complete removal of all materials. Contractor shall re-clean and dispose of any asbestos-containing material identified.

D. Vacuum any remaining material from sub surfaces, i.e., wire lath, concrete, pipe, steel joists, etc.

E. All polyethylene, tape, clothing and cleaning materials shall be bagged and disposed of as specified.

F. Clean all equipment, tools, etc., prior to removing them from work area.

G. Remove polyethylene on walls and ceiling. Critical barriers sealing all windows, doors, wall openings, ceiling openings, electrical outlets, etc., are to remain. Treat polyethylene as asbestos-contaminated materials.

H. Place asbestos-containing and asbestos-contaminated material while still wet into sealable, opaque or colored six (6) mil polyethylene bags. Do not overfill, place more than twenty-five (25) pounds into it or use it for disposal of sharp-edged materials.

I. Evacuate the bag with HEPA vacuum and seal collapsed bag by twisting top six (6) inches closed and wrapping with a minimum of two (2) layers of duct tape.

J. Twist top and fold over, apply second wrap of duct tape.

K. Clean outside of disposal bag by wet wiping and take bag to the equipment and staging area.

L. Affix warning and identification labels to opaque or colored bag and then place bag inside a second, six (6) mil polyethylene bag.

M. Seal outer bag by repeating steps I. and J.

N. Double-bagged waste shall be placed into a lined, covered receptacle or dumpster. Wastes must not remain on the ground.

O. HEPA filter unit to remain in place until space has been cleared by clearance test results.

P. Door into decontamination unit or load out room to remain.

Q. The Environmental Consultant will perform a visual inspection to verify all ACM has been removed.

R. The Environmental Consultant will perform final air clearance testing.

S. Remove critical barriers upon instructions from the Environmental Consultant.

T. Any alternate method of removal must have the written approval of the Owner and the Environmental Consultant.

3.05 HOUSEKEEPING

A. Throughout the work period, maintain the building and site in a standard of cleanliness as specified throughout these specifications.

B. Contaminated disposable clothing, respirator filters and other debris will be bagged, properly labeled and sealed at the end of each workday.

C. All asbestos generated by removal, encapsulation or repair will be bagged, properly labeled, and sealed at the end of each workday.

D. Respirators will be thoroughly cleaned at the end of each workday and stored for the next day's use.

E. Retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection of materials.

F. Do not allow the accumulation of scrap, debris, waste material, and other items not required for completion of this work.

G. At least weekly, and more often is necessary, completely remove all scrap, debris and waste material from the job site.

H. Unless otherwise noted or directed, materials resulting from demolition operations shall be the property of the AAC, shall not be used in the work and shall be promptly removed from the site.

I. Daily and more often if necessary, inspect the work areas and adjoining spaces, and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.

J. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

K. Maintain the site in a neat and orderly condition at all times.

L. Compressed air is not to be used for cleaning purposes.

3.06 FINAL DECONTAMINATION OF WORK AREA

A. Carefully double bag all removed asbestos material, labeling bags as required.

B. Bags shall be wiped with clean damp cloths prior to transportation to approved disposal site.

C. Plastic barriers, as specified, shall be carefully removed, folded inward rolled into bundles and bagged for disposal. Note: Final barriers are not to be removed until work is completed and instructed by the Environmental Consultant.

D. During decontamination of the work area (after asbestos removal), the AAC shall remove the polyethylene sheets from walls and floors only. The windows and doors shall remain sealed and any HEPA filtration systems shall remain in service until final acceptance.

E. Hard surfaces flooring such as concrete, terrazzo, VAT and ceramic tile, shall be wet mopped, allowed to dry, and damp mopped a second time with clean mop heads.

F. Walls, furniture and equipment (which remain in work area during work operations), windows and other surfaces shall be thoroughly cleaned with damp cloths.

G. And carpeting shall be cleaned with a HEPA type vacuum cleaner.

1) CONVENTIONAL VACUUMS WILL NOT BE PERMITTED.

H. All surfaces are to be left visually clean.

I. After the work area is found to be in compliance by visual inspection, and before removing plastic barriers, the Environmental Consultant shall take clearance samples as specified in Air Sample Schedule, Section 1.07J as soon as feasible but not sooner than twenty-four (24) hours after completion of all cleaning work, or as may be specified by the Owner. If analysis

results of all samples are below 0.01 fibers per cubic centimeter (f/cc), final air clearance has been achieved and the response action is complete.

J. Should final air clearance fail to meet the standard established above, the AAC shall pay all costs associated with the Environmental Consultant's re-sampling and analysis. At Contractor's sole option and at no additional cost to the Owner, PCM samples which fail to meet the clearance levels can be tested for compliance by the TEM protocol established in NIOSH 7402.

K. If pre-clearance criteria are not met, repeat final cleaning until additional tests indicate conformity before proceeding with final clearance.

L. All mop heads and cleaning cloths are to be discarded in the same manner as asbestos waste.

M. Clean all glass inside of work area.

N. All windows, doors, louvers, etc., shall be unsealed and the sheeting, tape etc., shall be disposed of as heretofore prescribed.

O. All plastic sheeting, tape, cleaning materials, clothing and all other disposable material or items used in the work area shall be packed into sealable plastic bags (6-mil. minimum) for transport. Double bagging is required.

3.07 DISPOSAL OF ASBESTOS WASTE

A. All asbestos materials and miscellaneous debris will be transported to the pre-designated disposal site in accordance with the guidelines of the U.S. EPA, Tide 40, Part 61, Subpart H, and all local agencies' regulations.

B. The landfill used for dumping shall be certified to receive and buy materials contaminated by asbestos.

C. Obtain signed waste shipment record indicating material is asbestos waste, and site it came from. Waste Disposal Manifests must also indicate amount of waste in cubic yards or tons.

D. Submit Waste Disposal Manifests to the Owner and the Environmental Consultant with final report.

3.08 RECORDKEEPING AND LOG

A. Maintain a daily log documenting the following items:
   1. Entry and exiting of work area by work personnel, visitors, and inspectors.
   2. Personnel air monitoring test results.
   3. Special or unusual events, such as power loss or equipment failure.
   4. Daily inspection of decontamination unit, load-out unit, containment area integrity, and air exhausting system.
   5. Amount of asbestos-containing material removed from the work site.
   6. Work progress narrative.

B. Provide a copy of the log to the Owner and the Environmental Consultant at the end of the project.

3.09 INSPECTIONS

A. All work procedures detailed in this specification will be strictly adhered to and meet or exceed all current EPA, OSHA, DEP, ACHD, and PDL&I regulations.

B. All work shall meet with the approval of the Owner and the Environmental Consultant. Work which does not meet with such approval shall be determined to be unsatisfactory.

END OF SECTION

SECTION 030100
MAINTENANCE OF CONCRETE

<<<< UPDATE NOTES

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Cleaning of existing concrete surfaces.

B. Repair of exposed structural, shrinkage, and settlement cracks.

C. Resurfacing of concrete surfaces having spalled areas and other damage.

D. Repair of deteriorated concrete.

E. Repair of internal concrete reinforcement.

F. Repair and strengthening of concrete with applied composite materials.

2.02 ABBREVIATIONS AND ACRONYMS

A. CFRP: Carbon Fiber Reinforced Polymer.

2.03 DEFINITIONS

A. Carbon Fiber Reinforced Polymer (CFRP): Composite material comprising a polymer matrix reinforced with carbon fiber cloth, mat, or strands.

2.04 REFERENCE STANDARDS

A. ACI PRC-440.2 - Design and Construction of Externally Bonded Fiber-Reinforced Polymer (FRP) Systems for Strengthening Concrete Structures—Guide; 2023.

B. ACI SPEC-440.8 - Specification for Carbon and Glass Fiber-Reinforced Polymer (FRP) Materials Made by Wet Layup for External Strengthening of Concrete and Masonry Structures; 2013 (Reapproved 2023).

C. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.

D. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.

E. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

F. ASTM C928/C928M - Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repairs; 2025.

G. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2024.

H. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

J. ICC-ES AC125 - Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber-Reinforced Polymer (FRP) Composite Systems; 2021, with Editorial Revision (2022).

K. ICC-ES AC178 - Acceptance Criteria for Inspection and Verification of Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) or Steel-Reinforced Polymer (SRP) Composite Systems; 2017, with Editorial Revision (2020).

L. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

2.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.

C. Shop Drawings for Applied Composite Repairs: Provide shop drawings indicating:
   1. Repair location.
   2. Repair details.
   3. Fiber type, dimensions, number, thickness, and direction of layers.
   4. Installation sequence.
   5. Splice details.
   6. Joint and end details.
   7. Anchorage.
   8. Connections.

D. Manufacturer's instructions.

E. CFRP manufacturer's instructions.

F. Field quality control submittals for CFRP.

2.06 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

B. Deliver polymer resin materials in original factory-sealed containers with manufacturer's labels intact and legible. Verify product nomenclature, manufacturer's name, product identification, batch number, date of manufacture, and shelf life or expiration date. Do not use polymer resin materials that have exceeded shelf life.

C. Store materials in covered, well-ventilated area and according to manufacturer's written storage instructions. Store polymer resins and hardeners separate from construction materials that can absorb odors.

PART 2 PRODUCTS

3.01 CLEANING MATERIALS

A. Detergent: Non-ionic detergent.

3.02 CEMENTITIOUS PATCHING AND REPAIR MATERIALS

A. Cementitious Repair Mortar, Trowel Grade: One- or two-component, factory-mixed, polymer-modified cementitious mortar.
   1. In-place material resistant to freezing conditions.
   2. Mixed with water or latex type bonding agent in proportions as recommended by manufacturer.
   3. Dry Material: Complies with ASTM C928/C928M.
   4. Integral corrosion inhibitor.

3.03 EPOXY PATCHING AND REPAIR MATERIALS

A. Epoxy Repair Mortar: Epoxy resin mixed with aggregate and other materials in accordance with manufacturer's instructions for purpose intended; comply with pot life and workability limits.
   1. Manufacturers:
      a. ARDEX Engineered Cements; ARDEX BACA: www.ardexamericas.com/#sle.
      b. Euclid Chemical Company; DURALFLEX FASTPATCH: www.euclidchemical.com/#sle.
      c. SpecChem, LLC; SpecPoxy 1000, SpecPoxy 2000, SpecPoxy 3000 or SpecPoxy 3000 FS: www.specchemllc.com/#sle.
      d. Sika, USA: SikaTop®-111 Plus: https://usa.sika.com/en/construction/repair-protection/mortars/horizontal/sikatop-111-plus.html.

3.04 CARBON FIBER REINFORCED POLYMER (CFRP) PATCHING AND REPAIR MATERIALS

A. Manufacturers:
   1. Fortress Stabilization Systems: www.fortressstabilization.com/#sle.
   2. Master Builders Solutions: www.master-builders-solutions.com/#sle.
   3. Rhino Products USA, Inc: www.rhinocarbonfiber.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

B. CFRP Systems, General:
   1. Design Criteria: Design CFRP system in accordance with ACI PRC-440.2 to provide strengthening for concrete.
   2. CFRP System Description:
      a. Wet Layup FRP System: Dry fiber sheets or fabrics impregnated on site with saturating resin, adhered to concrete surfaces, and cured in place.

C. CFRP System Design Criteria:
   1. Comply with ICC-ES AC125 Acceptance Criteria.
   2. Comply with ICC-ES AC178 Acceptance Criteria.
   3. 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.

D. CFRP Materials:
   1. Carbon Fiber Stitch: Comply with ACI SPEC-440.8. Fabricated unidirectional carbon fiber reinforcements with flared ends that are recessed into concrete material with epoxy paste to span and reinforce cracks.

PART 3 EXECUTION

4.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

B. Beginning of installation means acceptance of substrate.

4.02 PREPARATION

A. Prepare concrete surfaces to be repaired according to ICRI 310.2R .

B. Surface Preparation for CFRP Systems:
   1. Repair cracks according to CFRP manufacturer's written instructions.
   2. Cleaning: Remove loose and unsound materials. Remove contaminants that would inhibit bond, such as laitance, dust, dirt, oil, curing compound, existing paint or coatings, efflorescence, and other matter that could interfere with bond of CFRP system concrete surfaces.
   3. Concrete: Roughen surface according to CFRP manufacturer's written instructions.
   4. Apply CFRP system within 72 hours of surface preparation.

4.03 CLEANING EXISTING CONCRETE

A. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
   1. Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
   2. Clean out cracks and voids using same methods.

B. The following are acceptable cleaning methods, in order from gentlest to less gentle:
   1. Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
   2. Increasing the water washing pressure to maximum of 400 psi.
   3. Adding detergent to washing water; with final water rinse to remove residual detergent.
   4. Steam-generated low-pressure hot-water washing.

4.04 CONCRETE STRUCTURAL MEMBER REPAIR

A. See drawings for specific areas to be repaired.

B. Remove broken and soft concrete at least 1/4 inch (6 mm) deep.

C. Mechanically cut away damaged portions of reinforcement.

D. Blast clean remaining exposed reinforcement surfaces.

E. Work epoxy mortar into broken surface and build up patch to match original.

F. Feather edges of repairs flush to sound surface and trowel surface to match surrounding area.

4.05 CONCRETE SURFACE REPAIR USING EPOXY MORTAR

A. Clean concrete surfaces, cracks, and joints of dirt, laitance, corrosion, and other contamination using method(s) specified above and allow to dry.

B. Follow bonding agent and repair mortar manufacturer's written installation instructions.

C. Apply coating of bonding agent to entire concrete surface to be repaired as required by manufacturer.

D. Fill voids with epoxy mortar flush with surface.

E. Apply repair mortar by steel trowel to a minimum thickness of 1/4 inch (6 mm) over entire surface, terminating at a vertical change in plane on all sides.

F. Trowel finish to match adjacent concrete surfaces.

4.06 CONCRETE REPAIR USING CFRP MATERIALS

A. Wet Layup, Dry Layup, and Preimpregnated Systems:
   1. Install in accordance with manufacturer's written instructions.
   2. Apply saturating resin to full saturation of fibers according to manufacturer's written instructions.
   3. Remove air trapped between layers before resin sets.
   4. Place successive layers of saturating resin and fiber materials before complete cure of previous layer of resin.
   5. Handle sheet and fabric materials to maintain the fiber straightness and orientation. Remove and repair kinks, folds, or other forms of waviness.

END OF SECTION

SECTION 031000
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.

B. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 032000 - Concrete Reinforcing.

B. Section 033000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

2.02 WOOD FORM MATERIALS

A. Form Materials: At the discretion of the Contractor.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.03 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.04 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

3.05 FORMWORK TOLERANCES

3.06 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.07 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

END OF SECTION

SECTION 032000
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 031000 - Concrete Forming and Accessories.

B. Section 033000 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary; 2025.

B. ACI MNL-66 - ACI Detailing Manual; 2020.

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

D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2026.

E. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).

F. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.

H. CRSI (DA4) - Manual of Standard Practice; 2024.

1.04 SUBMITTALS

A. See Section 013000 - 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.

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. Galvanized in accordance with ASTM A767/A767M, Class I.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type; ASTM A1064/A1064M.

C. Reinforcement Accessories:
   1. Provide stainless steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.02 FABRICATION

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

PART 3 EXECUTION

3.01 PLACEMENT

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Comply with applicable code for concrete cover over reinforcement.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Sidewalks

C. Joint devices associated with concrete work.

D. Miscellaneous concrete elements, including equipment pads, light pole bases, and post foundations.

E. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 032000 - Concrete Reinforcing.

B. Section 079200 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

C. Section 321313 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code for Structural Concrete—Code Requirements and Commentary; 2025.

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

C. ACI PRC-213 - Guide for Structural Lightweight-Aggregate Concrete; 2014 (Reapproved 2023).

D. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction; 2015.

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

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

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

H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.

I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.

J. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

K. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.

L. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.

M. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete; 2023.

N. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.

O. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.

P. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

Q. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2024.

R. ASTM C989/C989M - Standard Specification for Slag Cement for Use in Concrete and Mortars; 2025.

S. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

T. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

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

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with admixture manufacturer's written recommendations.

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

E. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.
   1. Maintain one copy of each document on site.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 FORMWORK

A. Comply with requirements of Section 031000.

2.02 REINFORCEMENT MATERIALS

A. Comply with requirements of Section 032000.

2.03 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Lightweight Aggregate: ASTM C330/C330M.

D. Fly Ash: ASTM C618, Class C or F.

E. Ground Granulated Blast Furnace Slag: ASTM C989/C989M.

F. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
   1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.

G. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

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.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

E. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.

F. Retarding Admixture: ASTM C494/C494M Type B.

2.05 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:

2.06 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
   1. Products:
      a. Master Builders Solutions; MasterKure ER 50: www.master-builders-solutions.com/en-us/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.07 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 recommendations.
   1. Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI SPEC-301.
   1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.

D. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch (27.6 MPa).
   2. Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
   3. Water-Cement Ratio: Maximum 40 percent by weight.
   4. Total Air Content: 6 percent, determined in accordance with ASTM C173/C173M.
   5. Maximum Slump: 4 inches (100 mm).
   6. Maximum Aggregate Size: 5/8 inch (16 mm).

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.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

E. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions.

Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.

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

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.

F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 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. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.05 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.

3.06 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - 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. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.07 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

3.08 PROTECTION

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

END OF SECTION

SECTION 040100
MAINTENANCE OF MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water cleaning of exterior wall surfaces.

1.02 REFERENCE STANDARDS

A. ACI PRC-440.7 - Externally Bonded Fiber-Reinforced Polymer Systems Design and Construction for Strengthening Masonry Structures - Guide; 2022.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

C. ICC-ES AC125 - Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber-Reinforced Polymer (FRP) Composite Systems; 2021, with Editorial Revision (2022).

D. ICC-ES AC178 - Acceptance Criteria for Inspection and Verification of Concrete and Reinforced and Unreinforced Masonry Strengthening Using Fiber-Reinforced Polymer (FRP) or Steel-Reinforced Polymer (SRP) Composite Systems; 2017, with Editorial Revision (2020).

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on cleaning compounds.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry neatly stacked and tied on pallets. Store clear of ground with adequate waterproof covering.

B. Deliver polymer resin materials in original factory-sealed containers with manufacturer's labels intact and legible with verification of product nomenclature, manufacturer's name, product identification and batch number, date of manufacture, and shelf life or expiration date. Do not use polymer resin materials that have exceeded shelf life.

C. Store materials in covered, well-ventilated area protected from exposure to detrimental conditions, including airborne contaminants, dirt, dust, sunlight, temperatures lower than 40 degrees F (4 degrees C) or greater than 100 degrees F (38 degrees C), rainfall, sparks, or flame, and in accordance with the manufacturer's requirements. Store polymer resins and hardeners in separate area from construction materials that can absorb odors.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Warranty: Provide 5-year warranty for CFRP system design, installation, bond to the substrate, and interlaminar bond, as well as mechanical property retention and fabric-resin compatibility, commencing on Date of Substantial Completion. Complete forms in Owner's name and register with warrantor.

PART 2 PRODUCTS

2.01 CFRP SYSTEMS

A. Manufacturers:
   1. Substitutions: See Section 016000 - Product Requirements.

B. CFRP Systems:

C. Design Criteria:
   1. Design the CFRP system in conformance with ACI PRC-440.7 to provide seismic, wind, and blast strengthening for clay and concrete masonry walls.
   2. Comply with ICC-ES AC125 Acceptance Criteria.
   3. Comply with ICC-ES AC178 Acceptance Criteria.

4. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
5. VOC Content Limits: As specified in Section 016116.

END OF SECTION

SECTION 054000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud interior wall framing.

B. Exterior wall sheathing.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking and miscellaneous framing.

B. Section 076200 - Sheet Metal Flashing and Trim: Head and sill flashings.

C. Section 079200 - Joint Sealants.

D. Section 092116 - Gypsum Board Assemblies: Cold-formed steel nonstructural framing.

1.03 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 A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to metal framing systems, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on cold-formed steel structural members; include material descriptions and base steel thickness.

C. Product Data: Provide manufacturer's data on factory-made connectors and mechanical fasteners, showing compliance with requirements.

D. Design Data:

E. SSMA Manufacturer Qualification: Submit documentation of manufacturer association membership.

1.06 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.

PART 2 PRODUCTS

2.01 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.

B. Design Criteria: In accordance with applicable codes.
   1. Live load deflection meeting the following, unless otherwise indicated:
   2. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
   3. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

2.02 MATERIALS

A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.

2.03 STRUCTURAL FRAMING COMPONENTS

A. Wall Studs and Track Sections: AISI S240; c-shaped studs and u-shaped track sections in stud-matching nominal width and compatible height.

B. Jamb Studs: AISI S240; manufactured, engineered, c-shaped with wide flanges, designed to replace conventional double-stud framing at openings.

2.04 CONNECTIONS

A. Performance Requirements: Provide connections in compliance with requirements of AISI S240.

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 wall studs plumb and level.

B. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

C. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.

D. Install intermediate studs above and below openings to align with wall stud spacing.

E. Provide deflection allowance in stud track, directly below horizontal building framing at non-loadbearing framing.

3.04 INSTALLATION OF WALL SHEATHING

A. Install wall sheathing with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

END OF SECTION

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 092116 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

1.03 REFERENCE STANDARDS

A. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings; 2021.

B. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.

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

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

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. Comply with ASTM E985.

C. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot (1095 N/m) applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

D. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds (890 N) applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

E. Allow for expansion and contraction of members and building movement without damage to connections or members.

F. Dimensions: See drawings for configurations and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
   2. Intermediate Rails: 1-1/2 inches (38 mm) diameter, round.
   3. Posts: 1-1/2 inches (38 mm) diameter, round.

G. 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.

H. 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 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. Provide spigots and sleeves to accommodate site assembly and installation.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 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.

3.03 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 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTIONS INCLUDES

A. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

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

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org), and that provides grading service for species and grade specified. Provide lumber stamped with grade mark unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

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

3.02 BLOCKING, NAILERS, AND SUPPORTS

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

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

C. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Handrails.
   3. Grab bars.
   4. Towel and bath accessories.

3.03 CLEANING

A. Waste Disposal: See Section 017419 - 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 ground or buried in fill.

C. Prevent sawdust and wood shavings from entering storm drainage system.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at cavity wall construction and exterior wall behind wall finish.

B. Batt insulation and vapor retarder 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 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 C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2025.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2026.

H. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components; 2025.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

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

C. Shop Drawings: Submit drawings that indicate location of joint or termination detail conditions.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.04 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:
   1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
   2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.05 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation on Inside of Concrete and Masonry Exterior Walls: Polyisocyanurate board.

B. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
   1. Classifications:
      a. Type I: Faced with aluminum foil on both major surfaces of the core foam.
         1) Class 1 - Non-reinforced core foam.
         2) Compressive Strength: 16 psi (110 kPa), minimum.
         3) Thermal Resistance, R-value (RSI-value): At 1-1/2 inch (38.1 mm) thick; 9.0 (1.59), minimum, at 75 degrees F (24 degrees C).
   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. Water Vapor Permeance: 1.2 perm (68 ng/(Pa s sqm)), maximum, at 1 inch (25 mm) thickness, and when tested in accordance with ASTM E96/E96M, desiccant method.
   5. Comply with fire resistance requirements indicated on drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   6. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
   7. Board Thickness: 1.5 inch (37.5 mm).
   8. Products:
      a. GAF; EnergyGuard Polyiso Insulation: www.gaf.com/#sle.
      b. Hunter Panels; H-Shield: www.hunterpanels.com/#sle.

2.03 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.
   1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Facing: Aluminum foil, flame spread 25 rated; one side.
   6. Products:
      a. CertainTeed Corporation ; www.certainteed.com/#sle.
      b. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.owenscorning.com/en-us/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.

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 EXTERIOR WALLS

A. Adhere 6 inches (152 mm) wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.

1. Tape seal joints between sheets.
2. Extend sheet full height of joint.

B. Apply adhesive to back of boards:
1. Three continuous beads per board length.
2. Full bed 1/8 inch (3.2 mm) thick.

C. Install boards horizontally on walls.

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

3.03 BATT INSTALLATION

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

F. Staple or nail facing flanges in place at maximum 6 inches (152 mm) on center.

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

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

I. Tape seal tears or cuts in vapor retarder.

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

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:
1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

3.05 PROTECTION

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

END OF SECTION

SECTION 075400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.

B. Vapor retarder.

C. Flashings.

D. Roofing cant strips, stack boots, roofing expansion joints, and walkway pads.

1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASTM D6083/D6083M - Standard Specification for Liquid-Applied Acrylic Coating Used in Roofing; 2024.

C. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin-Based Sheet Roofing; 2021.

D. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2024.

E. NRCA (RM) - The NRCA Roofing Manual; 2026.

F. NRCA (WM) - The NRCA Waterproofing Manual; 2021.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

C. Shop Drawings: Submit drawings that indicate joint or termination detail conditions, conditions of interface with other materials, and paver layout.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Indicate membrane seaming precautions and perimeter conditions requiring special attention.

F. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, wind velocity during application, and supplementary instructions given.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be the previous manufacturer for the previous roof re-work to not void any warranty.

B. Installer Qualifications: Installer shall be the previous installer for the previous roof re-work to not void any warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.

C. Store materials in weather protected environment, clear of ground and moisture.

D. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

E. Protect foam insulation from direct exposure to sunlight.

1.06 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 90 degrees F (____ 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.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within five years after installation.

C. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Thermoplastic Polyolefin (TPO) Membrane Roofing Materials:
   1. Previous manufacturer as required by the existing warranty.

2.02 ROOFING - UNBALLASTED APPLICATIONS

A. Thermoplastic Membrane Roofing: One ply membrane, fully adhered, over insulation.

B. Roofing Assembly Requirements:
   1. Solar Reflectance Index (SRI): Minimum of 64 based on three-year aged value; if three-year aged data is not available, minimum of 82 initial value.
      a. Calculate SRI in accordance with ASTM E1980.
      b. Field applied coating may not be used to achieve specified SRI.

C. Surfacing: Colored roof coating.

D. Primer, Roof Coating: Water-based primer with high-tack finish that promotes adhesion for elastomeric roof coatings.

E. Roof Coating: Water-based acrylic elastomeric roof coating complying with ASTM D6083/D6083M.
   1. Color: to match existing..
   2. Dry Film Thickness (DFT) over Elastomeric Roofing: Two coats, 12 mil, 0.012 inch (0.30 mm) thick per coat, minimum.

2.03 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:

1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
    a. Thickness: 60 mil, 0.060 inch (1.5 mm), minimum.
2. Sheet Width:
    a. Adhered Application: Limit width to 120 inches (3,048 mm), maximum, when ambient temperatures are less than 40 degrees F (4.4 degress C) for extended period of time during installation.
3. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Membrane Fasteners: As recommended and approved by membrane manufacturer.

D. Vapor Retarder: Material approved by roof manufacturer complying with requirements of fire rating classification; compatible with roofing and insulation materials.
1. Fire-retardant adhesive.

E. Flexible Flashing Material: Same material as membrane.

F. Through-Wall Flashing: Cold-applied, self-adhering, styrene-butadiene-styrene (SBS) modified rubberized asphalt sheet membrane bonded with high density cross-woven polyethylene film.
1. Thickness: 47 mil, 0.047 inch (1.2 mm), minimum.
2. Width: 12 inches (305 mm), minimum.

G. Separation Sheet: Sheet polyethylene; 2 mil, 0.002 inch (0.05 mm) thick.

H. Water-Pervious Fabric: Woven polyethylene, UV-stabilized, open to moisture movement, black.

2.04 ACCESSORIES

A. Prefabricated Roofing Expansion Joint Flashing: Sheet butyl over closed-cell foam backing seamed to galvanized steel flanges.

B. Stack Boots: Prefabricated flexible boot and collar for pipe stacks through membrane; same material as membrane.

C. Membrane Adhesive: As recommended by membrane manufacturer.

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 INSTALLATION, GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during cold or wet weather conditions.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.03 INSTALLATION - VAPOR RETARDER AND INSULATION, UNDER MEMBRANE

A. Install vapor retarder to deck surface with adhesive in accordance with manufacturer's instructions.
   1. Extend vapor retarder under cant strips and blocking to deck edge.
   2. Install flexible flashing from vapor retarder to air seal material of wall construction, lap and seal to provide continuity of the air barrier plane.

B. Lay subsequent layers of insulation with joints staggered minimum 6 inches (152 mm) from joints of preceding layer.

C. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.

D. Do not install more insulation than can be covered with membrane in same day.

3.04 INSTALLATION - MEMBRANE

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at rate of 1.67 gallons per square foot (___ L/sq m). Fully embed membrane in adhesive except in areas directly over or within 3 inches (76 mm) of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. 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.

E. 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.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Install roofing expansion joints where indicated. Make joints watertight.
   1. Install prefabricated joint components in accordance with manufacturer's instructions.

H. Coordinate installation of roof drains and sumps and related flashings.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing in accordance with requirements.

C. Provide daily on-site attendance of roofing and insulation manufacturer's representative during installation of this work.

3.06 CLEANING

A. See Section 017000 - 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.

3.07 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 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and exterior penetrations.

B. Sealants for joints within sheet metal fabrications.

1.02 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; 2025a.

B. ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products; 2018 (Reapproved 2024).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement; 2025.

E. CDA A4050 - Copper in Architecture - Handbook; Current Edition.

F. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

A. See Section 013000 - 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.

B. Maintain one copy of each document on site.

C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sheet Metal Flashing and Trim:
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 SHEET MATERIALS

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24-gauge, 0.0239-inch (0.61 mm) thick base metal.
   1. Laminate: 20-mil, 0.02-inch (0.508 mm) PVC membrane laminated to one side of steel.

2.03 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.

2.04 FLASHING

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

2.05 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. 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. Comply with drawing details.

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.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

SECTION 078400
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 E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

B. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.

C. 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, with Editorial Revision (2024).

D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

E. FM (AG) - FM Approval Guide; Current Edition.

F. ITS (DIR) - Directory of Listed Products; Current Edition.

G. UL (DIR) - Online Certifications Directory; Current Edition.

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

I. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

J. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

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.

1.05 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 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. 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.

B. 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. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

C. 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. Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.03 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

A. Concrete and Concrete Masonry Walls and Floors:
   1. Floor-to-Floor Joints:
      a. 2 Hour Construction: UL System FF-D-1013; Hilti CFS-SP WB Firestop Joint Spray and CP 672. Or equal

B. Gypsum Board Walls:
   1. Wall-to-Wall Joints That Have Not Been Tested For Movement Capabilities (Static-S):
      a. 1 Hour Construction: UL System WW-S-0063; Specified Technologies Inc. SpeedFlex TTG Track Top Gasket. Or equal
   2. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
      a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant. Or equal
   3. Head-of-Wall Joints at Underside of Flat Concrete:
      a. 1 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray and CP 672. Or equal

2.04 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Blank Openings:
   1. In Floors or Walls:
      a. 2 Hour Construction: UL System C-AJ-0090; Hilti FS-ONE MAX Intumescent Firestop Sealant. Or equal

B. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant. Or equal

2. Uninsulated Metallic Pipe, Conduit, and Tubing:
    a. 2 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant. Or equal
3. Electrical Cables Not In Conduit:
    a. 2 Hour Construction: UL System C-AJ-3216; Hilti CFS-PL Firestop Plug. Or e
4. HVAC Ducts, Uninsulated:
    a. 2 Hour Construction: UL System C-AJ-7111; Hilti FS-ONE MAX Intumescent Firestop Sealant. Or equal

2.05 FIRESTOPPING SYSTEMS

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 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.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

C. Owner-provided field quality control.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).

B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).

C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

D. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2023.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.

G. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2025).

1.04 SUBMITTALS

A. See Section 013000 - 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. Backing material recommended by sealant manufacturer.
   4. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   5. Substrates the product should not be used on.

C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.

D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

E. 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.

F. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

G. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

H. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

I. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

J. Field Quality Control Log: Submit filled-out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

K. Executed warranty.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

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 with at least three years of documented experience.

D. 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.

E. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
   1. Identification of testing agency.
   2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
      a. Test date.
      b. Copy of test method documents.
      c. Age of sealant upon date of testing.
      d. Test results, modeled after the sample form in the test method document.
      e. Indicate use of photographic record of test.

F. Owner will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.
   1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.

G. Field Quality Control Plan:
   1. Visual inspection of entire length of sealant joints.
   2. Nondestructive field adhesion testing of sealant joints, except interior acrylic latex sealants.
      a. Test the entire length of every sealant joint.
   3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
      a. For each different sealant and substrate combination, allow for one test every 100 feet (30 m) in the first 1,000 linear feet (305 linear m), and one test per 1,000 linear feet (305 linear m) thereafter, or once per floor on each elevation.
      b. If any failures occur in the first 1,000 linear feet (305 linear m), continue testing at frequency of one test per 500 linear feet (152 linear m) at no extra cost to Owner.
   4. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per

sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

H. Field Adhesion Test Procedures:
   1. Allow sealants to fully cure as recommended by manufacturer before testing.
   2. Have a copy of the test method document available during tests.
   3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
   4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
   5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
   6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.

I. Nondestructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Continuous Method.

J. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
   1. Sample: At least 18 inches (457 mm) long.
   2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch (25.4 mm) by that percentage; if adhesion failure occurs before the 1-inch mark is that distance from the substrate, the test has failed.
   3. If either adhesive or cohesive failure occurs before minimum elongation, take necessary measures to correct conditions and retest; record each modification to products or installation procedures.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Nonsag Sealants:
   1. Dow; Dowsil 888: www.dow.com/#sle.
   2. Sika Corporation; SikaSil 728 NS: usa.sika.com/#sle.
   3. Tremco Commercial Sealants & Waterproofing; Dymonic 100: www.tremcosealants.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints:
      a. Around building perimeter
      b. At all edges and control joints of site paving.
   2. Interior Joints:
      a. Seal the following joints:
         1) Joints between door frames and window frames and adjacent construction.
         2) Joints between new tub/shower enclosures and surrounding finishes

B. Exterior Joints: Use nonsag _____ sealant, unless otherwise indicated. Tremco "Dymonic 100", Sika "SikaSil 728 NS", Dow "Dowsil 888", or equal.

C. Interior Joints: Use nonsag polyurethane sealant, unless otherwise indicated.

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with acceptable levels of volatile organic compound (VOC) content; see Section 016116.

2.04 NONSAG JOINT SEALANTS

A. Type S - Nonstaining Silicone Sealant: ASTM C920, Grade NS, Uses O; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.
   5. Cure Type: Multi-component, neutral curing.

B. Type S - Silicone Sealant: ASTM C920, Grade NS, Use T; single component, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.
   1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.

C. Type S - Silicone Sealant: ASTM C920, Grade NS, Uses M, A, G, and O; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.

D. Type S - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.

E. Type S - Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.
   1. Adheres to wet surfaces.
   2. Color: White.

F. Type S - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25% percent, minimum.

G. Type S - Nonsag Traffic-Grade Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
   1. Movement Capability: Plus and minus 50 percent, minimum.
   2. Hardness Range: 20 to 30, Shore A, when tested in accordance with ASTM C661.

2.05 ACCESSORIES

A. Sealant Backing Materials, General: Materials placed in joint before applying sealants; assists sealant performance and service life by developing optimum sealant profile and preventing three-sided adhesion; type and size recommended by sealant manufacturer for compatibility with sealant, substrate, and application.

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.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.
   1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
   2. Notify Architect of date and time that tests will be performed, at least seven days in advance.

3. Record each test on Preinstallation Adhesion Test Log as indicated.
4. If any sample fails, review products and installation procedures, consult manufacturer, or take other measures that are necessary to ensure adhesion; retest in a different location; if unable to obtain satisfactory adhesion, report to Architect.
5. After completion of tests, remove remaining sample material and prepare joints for new sealant installation.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

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 flush, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Owner will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.

C. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet (30 linear m), notify Architect immediately.

D. Destructive Adhesion Testing: If there are any failures in first 1,000 linear feet (300 linear m), notify Architect immediately.

E. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

F. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Thermally insulated hollow metal doors with frames.

D. Accessories, including glazing and louvers.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. ASCE: American Society of Civil Engineers.

C. HMMA: Hollow Metal Manufacturers Association.

D. NAAMM: National Association of Architectural Metal Manufacturers.

E. NFPA: National Fire Protection Association.

F. SCIF: Sensitive Compartmented Information Facility.

G. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2025.

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2024.

D. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2024.

E. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

F. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.

I. 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; 2025.

J. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

L. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

N. ITS (DIR) - Directory of Listed Products; Current Edition.

O. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

P. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.

Q. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.

R. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2023.

V. UL (DIR) - Online Certifications Directory; Current Edition.

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

1.05 SUBMITTALS

A. See Section 013000 - 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.

D. Samples: Submit two samples of metal, 2 by 2 inches (51 by 51 mm) in size, showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

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 MANUFACTURERS

A. Hollow Metal Doors and Frames. Including, but not limited to, the following:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Fleming Door Products, an Assa Abloy Group company; _____: www.assaabloydss.com/#sle.
   3. Premier Steel Doors and Frames: www.trustpremier.com/#sle.
   4. Steelcraft, an Allegion brand; ____: www.allegion.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Exterior Door Top Closures: Flush end closure channel, with top and door faces aligned.
   4. Door Edge Profile: Manufacturers standard for application indicated.

5. Typical Door Face Sheets: Flush.
6. 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.
8. 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.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Exterior Doors: Thermally insulated.
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 2 - Heavy-duty.
    b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    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 Thermal Resistance: U 0.37 maximum
4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
5. Weatherstripping: Integral, recessed into door edge or frame.

C. Interior Doors, Non-Fire-Rated:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 2 - Heavy-duty.
    b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
2. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

D. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 2 - Heavy-duty.
    b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.
2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
    a. Attach fire rating label to each fire rated unit.
4. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
5. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. 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 A40/ZF120 coating.
   2. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.
   3. Weatherstripping: Integral, recessed into frame edge.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
   1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

E. Door Frames, Fire-Rated: Full profile/continuously welded type.
   1. Fire Rating: Same as door, labeled.
   2. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

2.05 FINISHES

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

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
   1. Color: As selected by Architect from manufacturer's standard range.

2.06 ACCESSORIES

A. Glazing: 3/8" tempered and insulated glass per door schedule, factory installed.

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.

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 087100.
   1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

F. Touch up damaged factory finishes.

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.

3.06 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; non-rated and special function.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 099123 - Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

A. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

D. 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 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Samples: Submit two samples of door construction and f, 12 by 12 inches +/- (___ by ___ mm) in size cut from top corner of door.

D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

E. Manufacturer's Installation Instructions: Indicate special installation instructions.

F. Specimen warranty.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

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 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for 2 years. 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 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.

2.02 DOOR AND PANEL CORES

2.03 DOOR FACINGS

2.04 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

D. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

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.

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

1

SECTION 081743
AF SERIES FIRE-RATED FRP DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. AF-220FR Sandstone Texture Fire-Rated Fiberglass Door.

B. AF-222FR Sandstone Texture Fire-Rated Fiberglass Door installed in Fire-Rated Fiberglass Framing.

C. AF-220FR Sandstone Texture Fire-Rated Fiberglass Door installed in Fire-Rated Metal Framing.

1.02 REFERENCE STANDARDS

A. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2026.

B. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

C. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

D. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2025.

E. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor; 2025.

F. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact); 1993 (Reapproved 2024).

G. ASTM D4226 - Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products; 2025.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

I. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

K. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

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

1.03 RELATED SECTIONS

A. Section 04 00 00 – Masonry Mortar.

B. Section 08 80 00 – Glazing.

1.04 REFRENCES

A. ASTM D256 – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.

B. ASTM D570 – Standard Test Method for Water Absorption of Plastics.

C. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.

D. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

E. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

F. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

G. ASTM D4226 – Standard Test Methods for Impact Resistance of Rigid Poly(Vinyl Chloride) (PVC) Building Products

H. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

I. ASTM-G-53 - Standard Practice for Operating Light-and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

J. CAN / ULC S104 – Standard Method for Fire Tests of Door Assemblies.

K. UL 10B – Standard for Fire Tests of Door Assemblies.

L. UL 10C – Standard for Positive Pressure Fire Tests of Door Assemblies.

M. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.

N. NFPA 252 – Fire Tests of Door Assemblies.

1.05 SUBMITTALS

A. Must comply with Section 01 33 00 – Submittal Procedures.

B. Action Submittals/ Informational Submittals.
   1. Product Data.
      a. Submit manufacturer's product data sheets, catalog pages illustrating the products, description of materials, components, fabrication, finishes, installation instructions, and applicable test reports.
   2. Shop Drawings.
      a. Submit manufacturer's shop drawings, including elevations, sections, and details indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule, and finish.
   3. Samples.
      a. Submit manufacturer's door sample composed of door face sheet, core, framing and finish.
      b. Submit manufacturer's sample of standard colors for door face and frame.
   4. Testing and Evaluation Reports.
      a. Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed in Section 2.01 C.
   5. Manufacturer Reports.
      a. Manufacturer's Project References.
         1) Submit list of successfully completed projects including project name, location, name of architect, type, and quantity of doors manufactured.

C. Closeout Submittals.
   1. Operation and Maintenance Manual.
      a. Submit manufacturer's maintenance and cleaning instructions for doors and frames, including maintenance and operating instructions for hardware.
   2. Warranty Documentation.
      a. Submit manufacturer's standard warranty.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications.
   1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years concurrent successful experience.
   2. Door and frame components must be fabricated by same manufacturer.
   3. Evidence of a documented complaint resolution quality management system.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery.
   1. Deliver materials to site in manufacturer's original, unopened, containers and packaging.
   2. Labels clearly identifying opening, door mark, and manufacturer.

B. Storage.
   1. Store materials in a clean, dry area, indoors in accordance with manufacturer's instructions.

C. Handling.
   1. Protect materials and finish from damage during handling and installation.

1.08 WARRANTY

A. Warrant doors, frames, and factory installed hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.

B. Standard Period.
   1. Ten years starting on date of shipment.

C. Limited lifetime
   1. Covers failure of corner joinery, core deterioration, and delamination or bubbling of door skin and corrosion of all-fiberglass products while the door is in its specified application in its original installation.

D. Finish
   1. SpecLite3® face sheets 10 years from the date of shipment.
   2. Painted AF-220FR: 3 years.
   3. Painted FR frames: 3 years.

PART 2 PRODUCTS

2.01 FRP/ALUMINUM HYBRID DOORS

A. Manufacturer.
   1. Special-Lite, Inc.
      a. PO Box 6, Decatur, Michigan 49045.
      b. Toll Free (800) 821-6531, Phone (269) 423-7068, Fax (800) 423-7610.
      c. Web Site www.special-lite.com.
      d. E-Mail info@special-lite.com.

2.02 DESCRIPTION

A. AF-220FR Sandstone Texture Fire-Rated Fiberglass Door.
   1. Door Opening Size.
      a. 4'0" x 8'0" maximum size single swing.
      b. 8'0" x 8'0" maximum size standard pairs.
   2. Construction.
      a. Door Thickness.
         1) 1-3/4".
      b. Stiles.
         1) Single Swing.
            (a) Hinge and lock stile, 2" minimum tectonite with Palusol P-100 Intumescent and 0.090" thick fiberglass edge painted to match door face.
         2) Standard Pairs.
            (a) Hinge stile, 2" minimum tectonite with Palusol P-100 Intumescent and 0.090" thick fiberglass edge painted to match door face.
            (b) Meeting edge, 3" minimum with Palusol P-100 Intumescent and 0.090" thick fiberglass edge painted to match door face.
      c. Rails.
         1) Top rail, 6" minimum tectonite with Palusol P-100 Intumescent and 0.090" thick fiberglass edge painted to match door face.
         2) Bottom rail, 4" minimum for single swing, 4-1/2" minimum for pairs tectonite with 0.090" thick fiberglass edge painted to match door face.
      d. Core.

1) WSCP-412 proprietary mineral core.
2) 1-1/2" nominal thickness.
3) 18 pcf minimum density.

e. Face Sheet.
1) 0.120" thick, sandstone texture, through color FRP sheet.
2) Optional painted finish consult manufacturer.
3) Bonded to core with adhesive according to manufactures listing.

f. Cutouts.
1) Manufacture doors with cutouts for required vision lites per manufactures listing.

g. Hardware.
1) Pre-machine doors in accordance with templates from specified hardware manufacturers.
2) Field apply factory supplied gaskets and seals, full width intumescent and smoke seal required at top of door, smoke seals required on both jambs.

2.03 PERFORMANCE

A. Face Sheet.
1. Standard Interior and Exterior Class C 0.120" thick, Sandstone texture, through color FRP sheet.
a. Flexural Strength, ASTM D790: 27 x 103 psi (710.16 kPa).
b. Flexural Modulus, ASTM D790: 0.7 x 106 psi (730.84 kPa).
c. Tensile Strength, ASTM D638: 18 x 103 psi (710.16 kPa).
d. Tensile Modulus, ASTM D638: 1.0 x 106 psi (730.84 kPa).
e. Barcol Hardness, ASTM D2583: 40.
f. Izod Impact, ASTM D256: 7.0 ft-lb/in.
g. Gardner Impact Strength, ASTM-D5420: 30 inch (762 mm)-lb.
h. Water Absorption, ASTM D570: 0.16%/24hrs at 77°F.
i. Surface Burning, ASTM E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.
j. Chemical Resistance.
1) Excellent Rating.
(a) Acetic Acid, Concentrated.
(b) Acetic Acid, 5%.
(c) Bleach Solution.
(d) Detergent Solution.
(e) Distilled Water.
(f) Ethyl Acetate.
(g) Formaldehyde.
(h) Heptane.
(i) Hydrochloric Acid, 10%.
(j) Hydrogen Peroxide, 3%.
(k) Isooctane.
(l) Lactic Acid, 10%.

k. USDA/FSIS Requirements.
1) FRP face sheet with surfaseal is a finished outer surface material that is rigid; durable; non-toxic; non-corrosive; moisture resistant; a light, solid color such as white; easily inspected; smooth or an easily cleaned texture.
2) FRP face sheet with surfaseal does not contain any known carcinogen, mutagen, or teratogen classified as hazardous substances; heavy metals or toxic substances; antimicrobials; pesticides or substances with pesticidal characteristics.

B. Door Assembly.
1. 90 min pp category B door.
2. Temperature rise @ 30 min, 250 °F when vision lites do not exceed 100 inch (2540 mm)².

3. Temperature rise @ 60 min, 450 °F max.

2.04 MATERIALS

A. Fiberglass.
   1. See 2.02.A.2.e.
   2. See 2.02.B.2.e.
   3. See 2.02.C.2.e

B. Fasteners.
   1. All exposed fasteners will have a finish to match material being fastened.
   2. 410 stainless steel or other non-corrosive metal.
   3. Must be compatible with items being fastened.

2.05 FABRICATION

A. Factory Assembly.
   1. Door and frame components from the same manufacturer.
   2. Required size for door and frame units, shall be as indicated on the drawings.
   3. Maintain continuity of line and accurate relation of planes and angles.
   4. Secure attachments and support at mechanical joints with hairline fit at contact surfaces.

B. Shop Fabrication
   1. All shop fabrication to be completed in accordance with manufactures process work instructions.
   2. Quality control to be performed before leaving each department.

2.06 FINISHES

A. Door.
   1. FRP Face Sheets
      a. Through color.
         1) Per finish plan.

B. Door Paint
   1. Two-component flexible acrylic urethane Satin topcoat. (STANDARD)
      a. Per finish plan.
         1) Choose an item.
      b. Custom colors available consult manufacturer.
      c. Excellent exterior durability.
      d. Unique, high-solids, high-build, multifunctional coating.
      e. Low VOC, Satin coating.
      f. Impact Resistance, ASTM D4226 Minimum 1.2 in/lb/mil
      g. Color retention: ≤1Δ (CIE L.a.b.), Montreal 45° South: 12 months
      h. Very good chemical resistance.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine areas to receive doors.

B. Notify architect of conditions that would adversely affect installation or subsequent use.

C. Do no proceed with installation until unsatisfactory conditions are corrected.

3.02 PREPARATION

A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.03 ERECTION

A. Install doors in accordance with manufacturer’s instructions.

B. Install doors plumb, level, square, true to line, and without warp or rack.

C. Anchor frames securely in place.

D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by architect.

E. Set thresholds in bed of mastic and back seal.

F. Install exterior doors to be weathertight in closed position.

G. Repair minor damages to finish in accordance with manufacturer's instructions and as approved by architect.

H. Remove and replace damaged components that cannot be successfully repaired as determined by architect.

3.04 FIELD QUALITY CONTROL

A. Manufacture's Field Services.

1. Manufacturer's representative shall provide technical assistance and guidance for installation of doors.

3.05 ADJUSTING

A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.06 CLEANING

A. Clean doors promptly after installation in accordance with manufacturer's instructions.

B. Do not use harsh cleaning materials or methods that would damage finish.

3.07 PROTECTION

A. Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

1

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

1.03 SUBMITTALS

A. See Section 013000 - 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.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units with Return Air Grille:
   1. Location: As indicated on drawings.
   2. Panel Material: Aluminum extrusions with gypsum board inlay.
   3. Size: 12 by 12 inches (305 by 305 mm).
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Wall-Mounted Units in Wet Areas:
   1. Location: As indicated on drawings.
   2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   3. Size: 12 by 12 inches (305 by 305 mm).
   4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   6. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

C. Fire-Rated Wall-Mounted Units:
   1. Location: As indicated on drawings.
   2. Wall Fire-Rating: As indicated on drawings.
   3. Panel Material: Steel.
   4. Size: 12 by 12 inches (305 by 305 mm).
   5. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units with Return Air Grille:
   1. Location: As indicated on drawings.
   2. Panel Material: Aluminum extrusion with gypsum board inlay.
   3. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
   4. Size - Other Ceilings: 12 by 12 inches (305 by 305 mm).

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS WITH RETURN AIR GRILLES

A. Description: Return air grille with full service access. Louvers to be fitted into a frameless door that is flush with drywall surface. Return air grille can be integrated with manufacturer's suggested access panel or installed directly in drywall surface.

1. Gypsum Board Inlay Access Panels: Provide rectangular and square access panel with recessed and gasketed aluminum perimeter frame that acts as finishing edge and having concealed mechanical touch-latch with safety cable and free-pivoting hinge.
    a. Rectangular Panel Frame Size: 24 by 36 inches (610 by 914 mm) set within 1/2-inch (12 mm) thick gypsum board.
    b. Square Panel Frame Size: 24 by 24 inches (610 by 610 mm) set within 1/2-inch (12 mm) thick gypsum board.
    c. Panel Style: Standard style.
    d. Panel Frame: 1-inch (25 mm) margin with concealed countersunk screw mounting.
2. Return Air Grilles: Linear bar grille fitted with flush and concealed perimeter frame.
    a. Type: Fixed grilles with 1/4-inch (6 mm) thick by 5/8-inch (16 mm) deep bars at 1/2 inch (12 mm) on center providing 48 percent free space opening.
    b. Dimensions: 12 by 12 inches (305 by 305 mm) set within 1/2-inch (12 mm) thick gypsum board.
    c. Fabrication: Aluminum with factory powder coated finish.
    d. Frame: 1-inch (25 mm) margin with concealed countersunk screw mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 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 083323
OVERHEAD COILING DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior coiling doors.

B. Electric operators and control stations.

C. Wiring from electric circuit disconnect to operators and control stations.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 260583 - Wiring Connections: Power to disconnect.

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; 2025a.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

E. UL (DIR) - Online Certifications Directory; Current Edition.

F. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

G. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide general construction, electrical equipment, and component connections and details.

C. Shop Drawings: Indicate pertinent dimensioning, anchorage methods, hardware locations, and installation details.

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 work of type specified and with at least three years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by ITS (DIR), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose specified and indicated.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for roller shaft counterbalance assembly. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Overhead Coiling Metal Doors:

1. Overhead Door Corporation; Model 610 Rolling Service Door: www.overheaddoor.com/#sle.

2.02 COILING DOORS

A. Exterior Coiling Doors: Steel slat curtain.
   1. Capable of withstanding positive and negative wind loads of 20 psf (940 Pa) without undue deflection or damage to components.
   2. Finish: Powder Coated per Construction Drawings.
   3. Electric operation.
   4. Locking Devices: Lock and latch handle on outside.

2.03 MATERIALS

A. Metal Curtain Construction: Interlocking slats.
   1. Slat Ends: Alternate slats fitted with end locks to act as wearing surface in guides and to prevent lateral movement.
   2. Curtain Bottom for Slat Curtains: Fitted with angles to provide reinforcement and positive contact in closed position.
   3. Weatherstripping for Exterior Doors: Moisture and rot proof, resilient type, located at jamb edges, bottom of curtain, and where curtain enters hood enclosure of exterior doors.
   4. Steel Slats: Minimum thickness, 22 gauge, 0.0336 inch (___ mm); ASTM A653/A653M galvanized steel sheet.

B. Guide Construction: Continuous, of profile to retain door in place with snap-on trim, mounting brackets of same metal.

C. Lock Hardware:
   1. For motor operated units, additional lock or latching mechanisms are not required.
   2. Latch Handle: Manufacturer's standard.
   3. Slide Bolt: Provide on single-jamb side, extending into slot in guides, with padlock on one side.

2.04 ELECTRIC OPERATION

1

A. Operator, Controls, Actuators, and Safeties: Comply with UL 325; provide products listed by ITS (DIR), UL (DIR), or testing agency acceptable to authorities having jurisdiction.
   1. Provide interlock switches on motor operated units.

B. Electric Operators:
   1. Mounting: Side mounted.
   2. Motor Enclosure:
   3. Motor Rating: 1/3 HP (250 W); continuous duty.
   4. Motor Voltage: 120 volts, single phase, 60 Hz.
   5. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   6. Controller Enclosure: NEMA EN 10250, Type 4.
   7. Opening Speed: 12 inches per second (300 mm/sec).
   8. Brake: Manufacturer's standard type, activated by motor controller.
   9. Manual override in case of power failure.
   10. See Section 260583 for electrical connections.

C. Control Station: Provide standard three button, 'Open-Close-Stop' momentary-contact control device for each operator complying with UL 325.
   1. 24 volt circuit.
   2. Surface mounted, at interior door jamb.
   3. Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
      a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.

D. Safety Edge: Located at bottom of coiling door, full width, electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object, hollow neoprene covered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that electrical services have been installed and are accessible.

C. Verify that door opening is plumb, header is level, and dimensions are correct.

D. Notify Architect of any unacceptable conditions or varying dimensions.

E. Commencement of installation indicates acceptance of substrate and door opening conditions.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

E. Coordinate installation of electrical service with Section 260583.

F. Complete wiring from disconnect to unit components.

G. Complete wiring from fire alarm system.

H. Install enclosure and perimeter trim.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch (1.6 mm).

C. Maximum Variation From Level: 1/16 inch (1.6 mm).

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 feet (3.2 mm per 3 m) straight edge.

3.04 ADJUSTING

A. Adjust operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Clean installed components.

B. Remove labels and visible markings.

END OF SECTION

SECTION 084113
FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section covers Kawneer Aluminum Entrances, including glass and glazing, door hardware, and components.

B. Types of Kawneer Aluminum Entrances include:
   1.
      a. 350 Swing Door:
         1) Medium stile
         2) Vertical face dimension: 3-1/2" 3.5 inch (88.9 mm)
         3) Depth: 1-3/4" 1.75 inch (44.5 mm)
         4) High-traffic applications

C. Related Sections:

1.03 DEFINITIONS

A. For fenestration industry standard terminology and definitions, refer to the Fenestration & Glazing Industry Alliance (FGIA) Glossary (AAMA AG-13).

1.04 REFERENCE STANDARDS

A. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

B. AAMA 701/702 - Performance Specification for Pile Weatherstrips (AAMA 701) and Polymer Weatherseals (AAMA 702); 2023.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

1.05 PERFORMANCE REQUIREMENTS

A. General Performance:

B. Wind Loads:
   1. EDITOR NOTE: Provide wind load design pressures in PSF and include applicable building code and year edition.
      a. The entrance system shall include anchorage that is capable of withstanding the following wind load design pressures:

C. Air Leakage:
   a. For single-acting offset pivot or butt-hung entrances in the closed and locked position, the test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 1.57 psf (75 Pa) for single doors and pairs of doors.
   b. A single 3'0" x 7'0" (915 mm x 2134 mm) entrance door and frame shall not exceed 1.0 cfm/ft2.

c. A pair of 6'0" x 7'0" (1830 mm x 2134 mm) entrance doors and frame shall not exceed 1.0 cfm/ft2.

D. Structural-Test Performance:
   a. Corner strength shall be tested per the Kawneer dual moment load test procedure and certified by an independent testing laboratory to ensure weld compliance and corner integrity. (Testing procedure and certified test results are available upon request.)

E. Environmental Product Declaration (EPD): Shall have an Aluminum Extrusions EPD.

F. Material Ingredient Reporting:
   1. EDITOR NOTE: Include Material Ingredient Reporting if this section is necessary to meet project requirements or for any project that includes Green Building Certifications such as LEED, Living Building Challenge (LBC), and so on.
   2. EDITOR NOTE: Material Ingredient Reporting applies only for anodized products.
      a. Shall have a complete list of chemical ingredients to at least 100 ppm (0.01%) that covers 100% of the product.
      b. Acceptable documentation includes:
         1) Manufacturer's inventory with Chemical Abstract Service Registration Number (CASRN or CAS#):
            (a) Kawneer's Material Transparency Summary (MTS)
         2) Cradle to Cradle certification; either document listed below is acceptable for this option:
            (a) Cradle to Cradle Certified™ with Material Health section Silver or higher
            (b) Silver Level or higher Material Health Certificate
         3) Red List Free DECLARE label

1.06 SUBMITTALS

A. Product Data:
   a. For each type of aluminum-framed entrance door indicated, include:
      1) Construction details
      2) Material descriptions
      3) Fabrication methods
      4) Dimensions of individual components and profiles
      5) Hardware
      6) Finishes
      7) Installation instructions
   b. Recycled Content:
      1) EDITOR NOTE: Include these Recycled Content specifications if needed to meet project requirements or for a project that includes Green Building Certifications such as LEED, Living Building Challenge (LBC), etc.
      2) EDITOR NOTE: If Recycled Content requirements are not specified, prime (zero recycled content) aluminum could be supplied.
      3) Provide documentation that aluminum has a minimum of 50% mixed pre- and post-consumer recycled content.
      4) Provide a sample document illustrating project-specific information that will be provided after product shipment.
      5) After product has shipped, provide project-specific recycled content information:
         (a) Indicate recycled content, including the percentage of pre- and post-consumer recycled content per unit of product.
         (b) Indicate the relative dollar value of recycled content product to the total dollar value of product included in the project.
         (c) Indicate the location for recovery of recycled content.
         (d) Indicate the location of the manufacturing facility.
   c. Environmental Product Declaration (EPD):

1) Include an Aluminum Extrusions EPD.

d. Material Ingredient Reporting:

1) EDITOR NOTE: Include the Material Ingredient Reporting section only for anodized products.

2) Include documentation for material reporting that has a complete list of chemical ingredients to at least 100 ppm (0.01%) that covers 100% of the product.

B. Shop Drawings:

a. Plans
b. Elevations
c. Sections
d. Details
e. Hardware
f. Attachments to other work
g. Operational clearances
h. Installation details

C. Samples for Initial Selection:

a. Provide samples for units with factory-applied color finishes.
b. Provide samples of hardware and accessories involving color selection.

D. Samples for Verification:

a. Provide a verification sample for aluminum-framed entrance doors and required components.

E. Product Test Reports:

a. Provide test reports for each type of aluminum-framed entrance door used in the project.
b. Test reports must be based on evaluation of comprehensive tests performed by a qualified preconstruction testing agency.
c. Test reports must indicate compliance with performance requirements.

F. Fabrication Sample:

a. Provide a fabrication sample of a corner, consisting of a door stile and rail and using full-size components that show details of the following:

1) Joinery,
2) Glazing

G. Entrance Door Hardware Schedule:

a. Schedule shall be prepared by or under the supervision of supplier.
b. Schedule shall detail fabrication and assembly of entrance door hardware, including procedures and diagrams.
c. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.07 QUALITY ASSURANCE

A. Installer Qualifications:

a. Installer must have successfully installed the same or similar units required for the project and other projects of similar size and scope.

B. Manufacturer Qualifications:

a. Manufacturer must be capable of fabricating aluminum-framed entrance doors and storefronts that meet or exceed the stated performance requirements.
b. Manufacturer must document this performance by the inclusion of test reports and calculations.

C. Source Limitations:

a. Obtain aluminum-framed entrance doors through one source from a single manufacturer.

D. Product Options:
   a. Drawings indicate size, profiles, and dimensional requirements of aluminum-framed entrance doors and are based on the specific system indicated. Refer to Division 01 Product Requirements Section. Do not modify size and dimensional requirements.
   b. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

E. Mockups:
   a. Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   b. Build mockup for the type(s) of swing entrance door(s) indicated, in location(s) shown on drawings.

F. Pre-installation Conference:
   a. Conduct conference at project site to comply with requirements in Division 01 Project Management and Coordination Section.

1.08 PROJECT CONDITIONS

A. Field Measurements:
   a. Verify actual dimensions of aluminum-framed entrance door openings by field measurements before fabrication.
   b. Indicate measurements on shop drawings.

1.09 WARRANTY

A. Submit manufacturer's standard warranty for owner's acceptance.

B. Warranty Period:
   a. Two years from Date of Substantial Completion of the project provided however that in no event shall the Limited Warranty begin later than six months from date of shipment by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product:
   a. Kawneer Company, Inc.
   b. The door stile and rail face dimensions of the 4th Floor entrance door will be as follows:
      1) 350 Swing Door:
         (a) Vertical face dimension: 3-1/2" 3.5 inch (88.9 mm)
         (b) Top Rail: 3-1/2" 3.5 inch (88.9 mm)
         (c) Bottom Rail: 6-1/2" 6.5 inch (165.1 mm)
         (d) Optional Bottom Rail: 10" 10 inch (254 mm)
   c. Major portions of the door members shall be 0.125" 0.13 inch (3.2 mm) nominal thickness.
   d. Glazing molding shall be 0.05" 0.05 inch (1.3 mm) thick.
   e. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
   f. Provide adjustable glass jacks to help center the glass in the door opening.

B. Substitutions:
   a. Refer to Division 01 Substitutions Section for procedures and submission requirements.

2.02 MATERIALS

A. Aluminum Extrusions:
   a. Alloy and temper recommended by aluminum-framed entrance door manufacturer for strength, corrosion resistance, and application of required finish.
   b. Not less than 0.090" (2.3 mm) wall thickness at any location for the main frame and door leaf members.

B. Fasteners:
   a. Aluminum, nonmagnetic stainless steel or other materials must be non-corrosive and compatible with aluminum members, trim hardware, anchors, and other components.

C. Anchors, Clips, and Accessories:
   a. Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating.
   b. Anchors, clips, and accessories shall provide sufficient strength to withstand the design pressure indicated.

D. Reinforcing Members:
   a. Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating.
   b. Reinforcing members must provide sufficient strength to withstand the design pressure indicated.

E. Weather Seals:
   a. Provide weather stripping with integral barrier fin or fins of semi-rigid, polypropylene sheet or polypropylene-coated material.
   b. Comply with AAMA 701/702.

2.03 STOREFRONT ENTRANCE FRAMING SYSTEM

A. Storefront Entrance Framing:
   1.
      a. Trifab® VersaGlaze® 451T

B. Non-Brackets and Reinforcements:
   a. Manufacturer's standard high-strength aluminum with non-staining, non-ferrous shims for aligning system components.

C. Fasteners and Accessories:
   a. Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories must be compatible with adjacent materials.
   b. Where exposed, fasteners and accessories shall be stainless steel.

D. Perimeter Anchors:
   a. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

E. Packing, Shipping, Handling, and Unloading:
   a. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

F. Storage and Protection:
   a. Store materials so that they are protected from exposure to harmful weather conditions.

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b. Handle material and components to avoid damage.
c. Protect material against damage from elements, construction activities, and other hazards before, during, and after installation.

2.04 GLAZING

A. Glazing shall comply with requirements in Division 08 Glazing Section.

B. Glazing Gaskets:
   a. Manufacturer's standard compression types
   b. Replaceable, extruded EPDM rubber

C. Spacers and Setting Blocks:
   a. Manufacturer's standard elastomeric type

2.05 HARDWARE

A. General Hardware Requirements:
   a. Provide manufacturer's standard hardware.
   b. Hardware shall be fabricated from aluminum, stainless steel, or other corrosion-resistant material that is compatible with aluminum.
   c. Hardware shall be designed to smoothly operate, tightly close, and securely lock aluminum-framed entrance doors.

B. Standard Hardware:
   1.
      a. Weather-Stripping:
         1) Meeting stiles on pairs of doors shall be equipped with an adjustable astragal using wool pile with polymeric fin.
         2) The door weathering on a single-acting offset pivot or butt hung door and frame (single or pairs) shall be comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
      b. Sill Sweep Strips:
         1) EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners (necessary to meet specified performance tests)
      c. Threshold:
         1) Extruded aluminum
         2) One piece per door opening
         3) Ribbed surface

2.06 FABRICATION

A. Fabricate aluminum-framed entrance doors in sizes indicated.

B. Include a complete system for assembling components and anchoring doors.

C. Fabrication requirements:

D. Weather-stripping:

2.07 ALUMINUM FINISHES

A. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

PART 3 EXECUTION

3.01 EXAMINATION

A. With installer present, examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work:

B. Proceed with installation only after correcting unsatisfactory conditions.

3.02 INSTALLATION

A. Comply with drawings, shop drawings, and manufacturer's written instructions for installing aluminum-framed entrance doors, hardware, accessories, and other components.

B. Install aluminum-framed entrance doors so that the doors:

C. Set the sill threshold in a bed of sealant, as indicated, for weathertight construction.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Services:

END OF SECTION

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SECTION 084123
FIRE RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS-FIREFRAMES® ALUMINUM SERIES

PART 1 - GENERAL120

1.01 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. AAMA 611 - Specification for Anodized Architectural Aluminum; 2024.

C. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

D. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.

F. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

G. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

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

I. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2025.

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; 2025.

K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

L. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

M. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).

N. ASTM C1115 - Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories; 2017 (Reapproved 2026).

O. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.

P. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2026.

Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

S. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

T. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

U. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

V. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

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

X. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.02 1.1 SUMMARY

A. Section includes:
   1. 1. Fire rated glazing and framing systems for installation as sidelights, and transoms or wall sections in interior openings

VERIFY OTHER NEARBY ITEMS ARE SPECIFIED. THESE INCLUDE CONCRETE AND MASONRY INSERTS, CONCEALED FLASHING.

A. Related Sections:
   1. Section 07 84 00 “Firestopping:” Firestops between work of this section and other fire resistive assemblies.
   2. Section 07 92 00 – “Joint Sealants” for installation of joint sealants installed with steel fire-rated glazed curtain-wall systems and for sealants to the extent not specified in this Section.
   3. Section 08 17 43 – “AF Series Fire-Rated FRP Doors and Frames" or fire-rated doors.
   4. Section 08 71 00 “Door Hardware:” Door hardware other than that provided by the work of this section
   5. Section 08 41 23 – “Fire Rated Steel Framed Entrances – Fireframes Heat Barrier Series” for fire-rated doors.
   6. Section 08 41 23 – “Fire Rated Glass And Framing Systems – Fireframes Designer Series” for fire-rated doors.

2.02 1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA)
   1. AAMA 2603-2002 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   2. AAMA 2604 -2005 Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2605 -2005 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
   1. Fire safety related:
      a. a. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
   2. Material related
      a. a. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2007.
      b. b. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2006b.

C. American Welding Society (AWS)
   1. AWS D1.3 - Structural Welding Code - Sheet Steel; 2007

D. Builders Hardware Manufacturers Association, Inc.
   1. BHMA A156 - American National Standards for door hardware; 2006 (ANSI/BHMA A156).

E. Canadian Standards
   1. CAN/ULC-S101 Standard Test of Fire Endurance Tests of Building Construction and Materials
   2. CAN/ULC-S104 Standard Method of Fire Tests of Door Assemblies

3. CAN/ULC-S106 Standard Method of Fire Tests of Window and Glass Block Assemblies

F. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 252: Fire Tests of Door Assemblies
   3. NFPA 257: Fire Test of Window Assemblies

G. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Fire Tests of Window Assemblies.
   2. UL 10B: Fire Tests of Door Assemblies
   3. UL 10C: Positive Pressure Fire Tests of Window & Door Assemblies
   4. UL 263: Fire tests of Building Construction and Materials
   5. UL 752 Ratings of Bullet-Resistant Materials

H. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

I. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

J. American Society of Civil Engineers (ASCE)
   1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures; 2005

2.03 1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

2.04 1.4 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data:
   1. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings and installation instructions.

C. Shop Drawings:
   1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, and tolerances.

D. Sustainable Requirements:
   1. Living Building Challenge Compliance: Compliant
      a. I-13 Red List Declaration
   2. Environmental Product Declaration (EPD)
      a. Fireframes Aluminum Series with Pilkington Pyrostop Monolithic Glass

E. Structural Calculations (optional):
   1. Provide structural calculations sealed by a licensed professional engineer in the State in which the project is located; prepared in compliance with referenced documents and these specifications.

F. Samples (optional). For following products:
   a. Glass sample-as provided by manufacturer
   b. Sample of frame
   c. Verification of sample of selected finish

G. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

H. Warranties: Submit manufacturer's warranty.

I. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

1. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction

2.05 1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualifications according to
   1. International Accreditation Service for a Type A Third-Party Inspection Body (Field Services ICC-ES Third-Party Inspections Standard Operating Procedures, 00-BL-S0400 and S0401)
   2. International Accreditation Service for Testing Body-Building Materials and Systems
      1) Fire Testing
         (a) ASTM Standards E 119
         (b) CPSC Standards 16 CFR 1201
         (c) NFPA Standards 252, 257
         (d) UL Standards 9, 10B, 10C, 1784, UL Subject 63
         (e) BS 476; Part 22: 1987
         (f) EN 1634-1
         (g) CAN/ULC Standards S101, S104, S106

B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL 9. For 45-minute assemblies only.

C. Fire-Rated Wall Assemblies: Assemblies complying with ASTM E119 that are classified and labeled by UL, for fire ratings indicated, based on testing in accordance with UL 263, ASTM E119.

D. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by Underwriters Laboratories® maintaining a current listing or certification. Label assemblies accordance with limits of manufacturer's listing.

2.06 1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

2.07 1.7 PROJECT CONDITIONS

A. Obtain field measurements prior to fabrication of frame units. If field measurements will not be available in a timely manner coordinate planned measurements with the work of other sections.
   1. Note whether field or planned dimensions were used in the creation of the shop drawings.

B. Coordinate the work of this section with others effected including but not limited to: other interior and components and door hardware beyond that provided by this section.

2.08 1.8 WARRANTY

A. Provide the Pilkington Pyrostop® and Fireframes® standard five-year manufacturer warranty.

PART 2 – PRODUCTS

3.01 2.1 MANUFACTURERS - (ACCEPTABLE MANUFACTURERS/PRODUCTS]

A. Manufacturer Glazing Material: "Pilkington Pyrostop®" fire-rated glazing as manufactured by the Pilkington Group and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) e-mail tgp.sales@allegion.com, web site http://www.fireglass.com

B. Frame System: "Fireframes® Aluminum Series" fire-rated frame system as manufactured and supplied by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) e-mail tgp.sales@allegion.com, web site http://www.fireglass.com

C. Substitutions: Substitutions for Glazing Material and Frame System not permitted.

3.02 2.2 PERFORMANCE REQUIREMENTS

A. System Description:
   1. Steel fire-rated glazed wall and/or window system, dual aluminum cover cap format
      a. Face widths available:
         1) 2”
         2) Custom extruded aluminum cover caps
         3) Custom stainless steel cover caps
      b. Duration – Windows Capable of providing a fire rating for 120 minutes.
      c. Duration – Walls: Capable of providing a fire rating for 120 minutes.

B. Structural Performance
   1. Design and size the system to withstand structural forces placed upon it without damage or permanent set when tested in accordance with ASTM E330 using load 1.5 times the design wind loads and of 10 seconds in duration.
   2. Member deflection: Limit deflection of the edge of the glass normal to the plane of the glass to flexure limit of glass[of any framing member
   3. Live load deflection of the construction above these windows to which they are likely connected is limited to 3/16” or less.

COORDINATE THE LB/FT2 WITH THOSE REQUIRED IN THE FIELD TEST AT THE END OF THE SECTION.

4.01 2.3 MATERIALS - GLASS

A. Low-E Coated glass for use in insulated interior units when exposed to natural light See Section 08 80 00

B. Fire Rated Glazing: Composed of multiple sheets of Pilkington Optiwhite™ high visible light transmission glass laminated with an intumescent interlayer.

C. Impact Safety Resistance: ANSI Z97.1 and CPSC 16 CFR 1201(Cat. I and II).

D. * Low-E product.

E. Reference Chart E: PVB inner layer installed toward exterior.

F. Logo: Each piece of fire-rated glazing shall be labeled with a permanent logo including name of product, manufacture, testing laboratory (UL), fire rating period, safety glazing standards, and date of manufacture.

G. Glazing Accessories: Manufacturer’s standard compression gaskets, standoff, spacers, setting blocks and other accessories necessary for a complete installation.

4.02 2.4 MATERIALS –ALUMINUM FRAMES

A. Fireframes® Aluminum Series 120 minutes
   1. Steel Frame — The steel framing members are made of two halves, nom. 1.9 inch (48.26 mm). wide (1.9 inch (48.3 mm)) with a nom. minimum depth of 1.38 inch (35.05 mm). (1.38 inch (35 mm)) with lengths cut according to glazing size.
   2. Aluminum Trim — Supplied with the steel framing members. Nom. 2 inch (50.8 mm). (2 inch (50.8 mm)) wide with a nom. depth of 1.54 inch (39.12 mm). (1.54 inch (39 mm)) with lengths cut according to glazing size.
   3. Stainless Steel Standoffs — Supplied with the steel framing members. Nom 5/16 inch (7.94 mm). (0.31 inch (8 mm)) diameter with a nom. minimum depth of 1 1/8 inch (3.18 mm). (28 mm) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
   4. Stainless Steel Moment and Connecting Braces: — Supplied with the steel framing members. Nom 3/8 inch (9.52 mm). (0.39 inch (10 mm)) thick with a nom. minimum depth of 1 1/8 inch (3.18 mm). (1.1 inch (28 mm)) with depth adjusted to match Pilkington Pyrostop® Panel thickness.
   5. Framing Member Fasteners — Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1” Pan Head Sheet Metal Screws for door installation.

6. Glazing Gasket supplied with the steel framing members. Nom. 3/4 inch (19.05 mm). (0.75 inch (19 mm)) x 3/16 (0.18 inch (4.5 mm)) black applied to the steel framing members to cushion and seal the glazing material when installed.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B221 (ASTM B 221M).

C. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
   1. Structural Shapes, Plates, and Bars: ASTM A36/A36M Standard Specification for Carbon Structural Steel
   2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
   3. Hot-Rolled Sheet and Strip: 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

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
   1. Where fasteners are subject to loosening or turn out from thermal and structural movements, or vibration, use self-locking devices.
   2. Reinforce members as required to receive fastener threads.

2.5 ACCESSORIES

A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets:
   1. ASTM C864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: ¼" Calcium silicate.

E. Perimeter Anchors: Steel.

F. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression; Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)
   1. Available Products:
      a. Momentive
      b. Tremco
      c. Dow

G. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.
   1. Available Products:
      a. 3M CP 25WB+

2.6 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Available Manufacturers:
   1. Fibrex Insulations Inc.
   2. Owens Corning

3. Thermafiber.
4. Rockwool

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E136 for combustion characteristics; and of the following nominal density and thermal resistivity:
1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).
2. Fiber Color: Regular color, unless otherwise indicated.

6.02 2.7 FABRICATION

A. Obtain reviewed shop drawings prior to fabrication.

B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions or guaranteed openings.

C. Factory prepared, fire-rated steel door assemblies by TGP to be prehung, prefinished with hardware preinstalled for field mounting.

D. Field glaze door and frame assemblies.

6.03 2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish frames after assembly.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.9 POWDERCOAT FINISHES

A. Finish after fabrication.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

C. Aluminum Finishes-Powder-Coat
1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled cover caps before shipping, complying with manufacturer's recommended instructions for surface preparation including pretreatment, application, and minimum dry film thickness.
2. Color and Gloss: As indicated by manufacturer's designations.
3. Acceptable Manufacturers:
   a. Tiger Drylac
   b. Additional manufacturers as approved by TGP

D. Aluminum Finishes-Traditional
1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0 inch (0.01 mm) or thicker) complying with AAMA 611.
3. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0 inch (0.02 mm) or thicker) complying with AAMA 611.
4. Class II, Color Anodic Finish: AA-M12C22A32/A34 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, integrally colored or electrolytically deposited color coating 0 inch (0.01 mm) or thicker) complying with AAMA 611.

5. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0 inch (0.02 mm) or thicker) complying with AAMA 611.
6. Color: Light bronze.
7. Color: Match Architect's sample.
8. High-Performance Organic Finish (2-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 2-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604 and with coating and resin manufacturers' written instructions.
9. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
10. Color and Gloss: As indicated by manufacturer's designations.

PART 3 - EXECUTION

8.01 3.1 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions. Verify openings are sized to receive curtain wall system and sill plate is level in accordance with manufacturer’s acceptable tolerances.

B. Notify Architect of any conditions which jeopardize the integrity of the proposed fire wall / door system.

C. Do not proceed until such conditions are corrected.

8.02 3.2 INSTALLATION

A. See Fireframes Aluminum Series Installation Manual

8.03 3.3 REPAIR AND TOUCH UP

A. Anodized Finishes
   1. Protect the anodized finish from harsh chemicals such as concrete/mortar or muriatic acid/brick wash. If reasonable care is taken during handling and high and low pH chemicals can be avoided, repair and/or touch-up of an anodize finish will not be needed.
   2. Some rub marks on an anodized surface can be removed with a mild abrasive pad such as a Scotch-Brite pad prior to touch up painting.
   3. Touch-up paint should be used even more sparingly over anodize. Only the visible raw aluminum in the scratch or gouge should be touched up with a matching paint.

B. Powder Coated Finishes
   1. Limited to minor repair of small scratches. Use only manufacturer’s recommended products.
   2. Such repairs shall match original finish for quality or material and view.
   3. Repairs and touch-up not visible from a distance of 5 feet (152.4 cm) Owner and Architect to approve.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged.

3.4 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
   1. Do not clean with astringent cleaners. Use a clean “grit free” cloth and a small amount of mild soap and water or mild detergent.
   2. Do not use any of the following:
      a. a. Steam jets
      b. b. Abrasives
      c. c. Strong acidic or alkaline detergents, or surface-reactive agents
      d. d. Detergents not recommended in writing by the manufacturer
      e. e. Do not use any detergent above 77 degrees Fahrenheit (25 degrees Celsius)
      f. f. Organic solvents including but not limited to those containing ester, ketones, alcohols, aromatic compounds, glycol ether, or halogenated hydrocarbons.
      g. g. Metal or hard parts of cleaning equipment must not touch the glass surface

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION

1

SECTION 084126
ALL-GLASS ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. All-glass entrances.

B. All-glass storefronts.

C. Swinging doors.

D. Interior sliding doors.

1.02 RELATED REQUIREMENTS

A. Section 054000 - Cold-Formed Metal Framing: Supplementary supports.

B. Section 087100 - Door Hardware.

C. Section 092116 - Gypsum Board Assemblies.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).

B. ASTM C1036 - Standard Specification for Flat Glass; 2025.

C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

D. BHMA A156.3 - Exit Devices; 2025.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each component in all-glass entrance assembly.

C. Shop Drawings: Drawings showing layout, dimensions, identification of components, and interface with adjacent construction.
   1. Include field measurements of openings.
   2. Include elevations showing:
      a. Appearance of all-glass entrance layouts.
      b. Locations and identification of manufacturer-supplied door hardware and fittings.
      c. Locations and sizes of cut-outs and drilled holes for other door hardware.
   3. Include details of:
      a. Requirements for support and bracing at openings.
      b. Installation details.
      c. Appearance of manufacturer-supplied door hardware and fittings.

D. Certificates: Contractor's certification that installer of entrance assemblies meets specified qualifications.

E. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, documenting compliance of exterior assemblies with wind pressure criteria.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Installer Qualifications: Minimum three years of experience installing entrance assemblies similar to those specified in this section.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. All-Glass Entrances and Storefronts:
   1. Trulite Glass & Aluminum Solutions, LLC; _____: www.trulite.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Fittings and Hardware:
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 ALL-GLASS ENTRANCES AND STOREFRONTS ASSEMBLIES

A. Entrances and Storefronts: Factory fabricated assemblies consisting of frameless glass panels fastened with metal structural fittings in configuration indicated on drawings.
   1. Exterior Assemblies: Designed to resist the following wind pressures:
      a. Positive Pressure: 25 psf (___ Pa).
      b. Negative Pressure: 30 psf (___ Pa).
   2. Operational Loads: Designed to withstand door operation under normal traffic without damage, racking, sagging, or deflection.
   3. Prepared for all specified hardware whether specified in this section or not.
   4. Finished metal surfaces protected with strippable film.
   5. Factory assembled to greatest extent practicable; may be disassembled to accommodate shipping constraints.

B. Swinging Door Fittings and Hardware:
   1. Top and bottom pivots concealed in full width rails top and bottom.
   2. Overhead Closer Concealed in Frame: _____.
   3. Single Doors: Floor mounted door stop.

2.03 FITTINGS AND HARDWARE

A. Rail Style Fittings for Swinging Doors and Related Fixed Glazing:
   1. Top Rails: 4-7/8 inch (124 mm) high with matching end caps.
   2. Bottom Rails: 4 inch (102 mm) high with matching end caps.
   3. Sidelite Rails: Match door rail sightlines.
   4. Exposed Edge Profile: Square.

B. Exit Devices (Panic Hardware) for Glass Swinging Doors: Bolt action mechanism hidden within interior of door handle, and meeting requirements of BHMA A156.3, Grade 1, Type 2.
   1. Latching bolt with manual and electric strikes.
   2. Glass Thickness: 1/2 to 3/4 inch (12.7 to 19 mm).
   3. Finish: As indicated.

2.04 MATERIALS

A. Glass: Flat glass meeting requirements of ASTM C1036, Type I - Transparent Flat Glass, Quality Q3, and Kind FT, fully tempered, in accordance with ASTM C1048, and as follows:
   1. Thickness: 3/8 inch (9.5 mm).
   2. Color: Class 1, Clear.
   3. Temper glass materials horizontally; visible tong marks or tong mark distortions are not permitted.

B. Sealant: One-part silicone sealant, comply with ASTM C920, clear.

2.05 ACCESSORIES

A. Fixed Glazed Panel Fittings: Sufficient to structurally support glazing and doors under specified loads; including but not limited to cover caps for door hardware, glazing mullions, clamp fittings, and panel corner patches.

B. Sidelight and Transom Fittings:
   1. Rails: Match profile, material, and finish of rails specified for doors.
   2. Provide top and bottom installation track for sidelite installation.

C. Swinging Door Fittings with Pivots: Patch fitting at top pivot corner of door; continuous rail with pivot at bottom of door.
   1. Rail Cross-Section: 1-3/4 inches (44.4 mm) wide by 3-1/2 inches (88.9 mm) high.
   2. Rail Profile: Tapered.

D. Sliding Door Fittings: Continuous rail at top and bottom of door:
   1. Rail Cross-Section: 1-3/4 inches (44.4 mm) wide by 4 inches (101 mm) high.
   2. Rail Profile: Tapered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are acceptable.

B. Do not begin installation until substrates and openings have been properly prepared.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Installation of cold-formed metal framing for openings as specified in Section 054000.

B. Installation of metal framing for openings as specified in Section 092116.

C. Install in accordance with manufacturer's installation instructions.

D. Tolerances:
   1. Horizontal Components and Sight Lines: Not more than 1/8 inch in 10 feet (3.2 mm in 3 m) variation from level, non-cumulative.
   2. Vertical Components and Sight Lines: Not more than 1/8 inch in 10 feet (3.2 mm in 3 m) variation from plumb, non-cumulative.
   3. Variation from Plane or Indicated Location: Not more than 1/16 inch (1.6 mm).

E. Installation of door hardware not supplied by entrance/storefront manufacturer as specified in Section 087100.

3.04 ADJUSTING

A. Adjust doors to operate correctly, without binding to frame, sill, or adjacent doors.

B. Adjust door hardware for smooth operation.

3.05 CLEANING

A. Clean installed work to like-new condition.

3.06 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 084229
AUTOMATIC ENTRANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sliding type packaged power-operated door assemblies.

B. Swinging type packaged power-operated door assemblies.

C. Controllers, actuators and safety devices.

1.02 RELATED REQUIREMENTS

A. Section 087113 - Power Door Operators.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. 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.

C. BHMA A156.10 - Power Operated Pedestrian Doors; 2024.

D. ITS (DIR) - Directory of Listed Products; Current Edition.

E. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL (DIR) - Online Certifications Directory; Current Edition.

G. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - 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: Include system components, sizes, features, and finishes.

D. Maintenance Contract.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.
   2. Wrenches and other tools required for maintenance of equipment.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience, and a member of AAADM.

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

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for all assembly parts. Complete forms in Owner's name and register with manufacturer.

C. Extended Correction Period: Correct defective work within 5-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Swinging Automatic Entrance Door Assemblies:
   1. ASSA ABLOY Entrance Solutions; Besam SW200i: www.besam-usa.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Sliding Automatic Entrance Door Assemblies:
   1. ASSA ABLOY Entrance Solutions; Besam SL500: www.besam-usa.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

C. All-Glass Sliding Automatic Entrance Door Assemblies:
   1. ASSA ABLOY Entrance Solutions; Besam SL500 CGL All Glass Slider: www.besam-usa.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 POWER OPERATED DOORS

A. Power Operated Doors: Provide products that comply with NFPA 101 and requirements of authorities having jurisdiction; provide equipment selected for actual door weight and for light pedestrian traffic, unless otherwise indicated.
   1. Swinging Fire Door Operators: In addition to other requirements, provide equipment ITS (DIR) or UL (DIR) listed as a fire door operator with automatic closer.
   2. Swinging Door Operators: Fully adjustable for opening and closing speeds, checking speeds, and hold-open time; in the event of power failure, disengage operator allowing door to function as a door with a spring closer.
   3. Sliding and Folding Door Operators: In the event of power failure, provide for manual open, close, and break-away operation of door leaves.
   4. Packaged Door Assemblies: Provide components by single manufacturer, factory-assembled, including doors, frames, operators, actuators, and safeties.
      a. Finish exposed equipment components to match door and frame finish.
   5. Air Leakage: Maximum of 1 cfm/sf (5 L/sec/sq m) of wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure differential across assembly.
   6. Exterior Swinging Doors: Provide equipment capable of operating, closing, and holding doors closed under positive and negative differential pressure; if necessary, provide power closing.
   7. Exterior and Vestibule Doors: Provide equipment suitable for operating temperature range of minus 20 to plus 140 degrees F (minus 29 to plus 60 degrees C) ambient.

B. Sliding and Folding Doors with Full Power Operators: Comply with BHMA A156.10; safeties required; provide break-away operation unless otherwise indicated; in the event of break-away operation, interrupt power operation.
   1. Comply with UL 325; acceptable evidence of compliance includes UL (DIR) or ITS (DIR) listing or test report by testing agency acceptable to authorities having jurisdiction.

C. Swinging Doors with Full Power Operators: Comply with BHMA A156.10; safeties required.

2.03 AUTOMATIC ENTRANCE DOOR ASSEMBLIES

A. Comply with ADA Standards for egress requirements.

B. Framing and Transom Members: Provide manufacturer's standard extruded aluminum framing, reinforced as required to support imposed loads.
   1. Nominal Sizes:
      a. Single Slide and Bi-Parting Sliding Doors: 1-3/4 inch (44.5 mm) wide by 4-1/2 inch (114.3 mm) deep.
   2. Transoms: Provide flush glazed transom with framing that is integral with automatic entrance framing system.

C. Door and Sidelight Construction: Heavy duty interlocked extruded aluminum tubular stile and rail sections, through-rod bolted construction with steel corner support at hinge stile of carrier-

suspended swinging panels or mechanically fastened corners with welded reinforcing brackets to reduce sag in sliding or breakout mode.

1. Door Thickness: 1-3/4 inch (44.5 mm), nominal.
2. Stile Design:
   a. Medium stile, 3-1/2 inch (89 mm), nominal width.
3. Top Rail Height: 4 inch (102 mm), nominal.
4. Center Rail (Muntin Bar) Height: 2 inch (51 mm), nominal.
5. Bottom Rail Height: 4 inch (102 mm), nominal.
6. Glazing Stops: Manufacturer's standard snap-on extruded aluminum square stops with preformed resilient glazing gaskets.
7. Glazing Stop Width: Manufacturers standard.
8. Glazing Thickness: 1/4 inch (6 mm).

D. Swinging Automatic Door: Single-acting hinged, electric operation, extruded aluminum glazed door, with extruded tubular frame, and operator concealed overhead with sloped cover.

1. Operation: Full-power open, spring close operation.

2.04 OPERATORS FOR SWINGING DOORS PROVIDED BY OTHERS

A. See Section 087113 - Power Door Operators.

2.05 OPERATORS FOR SLIDING DOORS PROVIDED BY OTHERS

A. See Section 087113 - Power Door Operators.

2.06 CONTROLLERS, ACTUATORS, AND SAFETIES

A. Controller: Provide microprocessor operated controller for each door.

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, at the correct location, and is of the correct characteristics.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's written instructions, except where more stringent requirements are specified.

B. Install entrances securely anchored in place, plumb, level, and true to location, in alignment with established lines and grades, without warp, bow, or racking of members.

C. Where frames are assembled in field, fit frame joints hairline tight without burrs or distortion; rigidly secure nonmoving joints and seal watertight.

D. Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.

E. Provide for dimensional distortion of components during operation.

F. Install pneumatic lines and door power units in a manner to prevent condensation or freezing.

G. Coordinate installation of components with related and adjacent work; level and plumb.

3.03 ADJUSTING

A. Adjust entrances for correct function and smooth operation, without binding or scraping and without excessive noise; lubricate operating hardware and other moving parts.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove temporary protection; clean exposed surfaces.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017900 - Demonstration and Training for additional requirements.

B. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.06 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Provide a separate maintenance contract for specified maintenance service.

C. Provide service and maintenance of operating equipment for one year from Date of Substantial Completion, at no extra charge to Owner.

END OF SECTION

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for hollow metal and Aluminum doors.

B. Hardware for fire-rated doors.

C. Electrically operated and controlled hardware.

D. Thresholds.

E. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. BHMA A156.1 - Standard for Butts and Hinges; 2025.

C. BHMA A156.2 - Bored and Preassembled Locks and Latches; 2022.

D. BHMA A156.3 - Exit Devices; 2025.

E. BHMA A156.4 - Door Closers and Pivots; 2024.

F. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

G. BHMA A156.7 - Template Hinge Dimensions; 2022.

H. BHMA A156.16 - Standard for Auxiliary Hardware; 2023.

I. BHMA A156.21 - Thresholds; 2025.

J. BHMA A156.22 - Standard for Gasketing; 2021.

K. BHMA A156.25 - Electrified Locking Devices; 2023.

L. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2023.

M. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2024.

N. BHMA A156.36 - Auxiliary Locks; 2020.

O. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

P. DHI (KSN) - Keying Systems and Nomenclature; 2019.

Q. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

R. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

U. UL (DIR) - Online Certifications Directory; Current Edition.

V. UL 10C - Standard for Positive Pressure Fire 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. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. 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.

D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

1.05 SUBMITTALS

A. See Section 013000 - 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. Provide complete description for each door listed.

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. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1.06 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

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

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) 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 017800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
   1. Closers: Five years, minimum.

2. Exit Devices: Three years, minimum.
3. Locksets and Cylinders: Three years, minimum.
4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 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. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
5. 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.
1. See Section 281000 for additional access control system requirements.

E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule.

F. 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.

2.02 HINGES

A. 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. Provide hinges on every swinging door.
3. Provide following quantity of butt hinges for each door:
a. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.

2.03 EXIT DEVICES

A. 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 UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

6. For electrical options, provide quick connect plug-in pre-wired connectors.

2.04 LOCK CYLINDERS

A. Lock Cylinders: Ensure new hardware cylinder is compatible with keyways salavaged from existing hardware.

2.05 CYLINDRICAL LOCKS

A. Manufacturers: Falcon

B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
   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.

2.06 AUXILIARY LOCKS (DEADLOCKS)

A. Auxiliary Locks (Deadlocks): Comply with BHMA A156.36, Grade 1.

2.07 CLOSERS

A. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.
   3. Provide door closer on each fire-rated and smoke-rated door.
      a. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.
   4. At outswinging exterior doors, mount closer on interior side of door.

2.08 POWER DOOR OPERATORS

A. See Section 087113.

2.09 PROTECTION PLATES

A. Protection Plates: Comply with BHMA A156.6.

B. Metal Properties: Aluminum material.
   1. Metal, Standard Duty: Thickness 0.050 inch (1.27 mm), minimum.

C. Edges: Beveled, on four sides unless otherwise indicated.

D. Fasteners: Countersunk screw fasteners.

2.10 KICK PLATES

A. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch (203 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.11 DOOR HOLDERS

A. Door Holders: Comply with BHMA A156.16, Grade 1.
   1. Provide surface mounted door holders when wall or floor stop is not applicable and hold-open device is mounted on door.
   2. Type: Lever, or kick down stop, with rubber bumper at bottom end.
   3. Material: Aluminum.

2.12 WALL STOPS

A. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Provide wall stops to prevent damage to wall surface upon opening door.
   2. Type: Bumper, concave, wall stop.

3. Material: Aluminum housing with rubber insert.

2.13 THRESHOLDS

A. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at each exterior door, unless otherwise indicated.
   2. Provide threshold at unit entry doors, unless otherwise indicated.
   3. Type: Flat surface.
   4. Material: Aluminum.
   5. Threshold Surface: Fluted horizontal grooves across full width.
   6. Field cut threshold to profile of frame and width of door sill for tight fit.
   7. Provide non-corroding fasteners at exterior locations.

2.14 WEATHERSTRIPPING AND GASKETING

A. 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 weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.
   5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.15 SILENCERS

A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.16 WIRELESS ACCESS MANAGEMENT SYSTEMS

A. Wireless Access Management Systems: Comply with guidelines of BHMA A156.25, and including necessary hardware for fully functional system.
   1. Reader Formats: Provide magnetic stripe, proximity, dual validation, or key Fob to activate access system functionality.
   2. Door Locking Hardware: Provide applicable cylindrical locksets, panic hardware, or mortise locksets in compliance with project access control requirements.

2.17 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. Supply keys in following quantities:
      a. 1 each Grand Master keys.

2.18 FINISHES

A. Finishes: Identified in Shop Drawing submittal of Door Hardware Schedule.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. 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.

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.

3.02 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Section 014000 - Quality Requirements.

3.03 ADJUSTING

A. Adjust work under provisions of Section 017000 - 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. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

3.05 PROTECTION

A. Protect finished Work under provisions of Section 017000 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 088000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

1.02 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).

C. ASTM C1036 - Standard Specification for Flat Glass; 2025.

D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.

E. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2021a.

F. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

G. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2019.

H. GANA (GM) - GANA Glazing Manual; 2022.

I. GANA (SM) - GANA Sealant Manual; 2008.

J. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

K. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

L. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

M. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2026.

N. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

1.04 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.

1.05 MOCK-UPS

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide on-site glazing mock-up with the specified glazing components.

C. Locate where directed.

D. Mock-ups may remain as part of the Work.

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 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. GGI - General Glass International: www.generalglass.com/#sle.
   2. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   3. Viracon, Inc: www.viracon.com/#sle.
   4. Substitutions: See Section 016000 - 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. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. 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.
   3. 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:

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.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.

2.04 INSULATING GLASS UNITS

A. Manufacturers:
   1. Glass: Any of the manufacturers specified for float glass.

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. Spacer Color: Black.
   4. Edge Seal:
      a. Color: Black.
   5. Purge interpane space with dry air, hermetically sealed.

C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed; vacuum seal.
   1. Applications: Exterior glazing unless otherwise indicated.

2. Space between lites filled with argon.
3. Vacuum seal space between lites.
4. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Tint: Clear.
5. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
   a. Tint: Clear.
6. Total Thickness: 1 inch (25.4 mm).
7. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.36, nominal.

2.05 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Insulating Glass Units: Vision glazing, with low-e coating.
   1. Applications: Exterior insulating glass glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Total Thickness: 1 inch (25.4 mm).
   4. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.36, nominal.
   5. 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.
   6. Spacer Color: Black.
   7. Edge Seal:
   8. Color: Black.
   9. Purge interpane space with dry air, hermetically sealed.

2.06 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. 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 the minimum required face and edge clearances are being provided.

C. 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.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. 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 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

C. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove nonpermanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. 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.

3.07 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

1

SECTION 088813
FIRE-RATED GLASS – FIRELITE PLUS®

SECTION 08 88 13 - FIRE-RATED GLASS – FIRELITE PLUS®

PART 1 GENERAL

2.01 SUMMARY

A. Section Includes:
   1. Fire-rated glazing materials installed as vision lights in fire-rated doors.

B. Related Sections include the following:
   1. Section 06 40 00 “Architectural Woodwork” for wood frames for doors, sidelights, transoms, borrowed lights.
   2. Section 08 11 00 “Metal Doors and Frames” for vision panels in interior doors and interior vision panel (borrowed lites) frames.
   3. Section 08 14 16 “Flush Wood Doors” for vision panels in interior doors.

2.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E2010-01: Standard Test Method for Positive Pressure Fire Tests of Window Assemblies.

B. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

C. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

D. Glass Association of North America (GANA):
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

E. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 252 – Fire Tests of Door Assemblies.
   3. NFPA 257 – Fire Tests of Window Assemblies.

F. Underwriters Laboratories, Inc. (UL):
   1. UL 9 – Fire Tests of Window Assemblies.
   2. UL 10B – Fire Tests of Door Assemblies.
   3. UL 10C – Positive Pressure Fire Tests of Door Assemblies.

G. Standard Council of Canada:
   1. CAN/ULC-S101 Standard Test of Fire Endurance Tests of Building Construction and Materials
   2. CAN/ULC-S104 Standard Method of Fire Tests of Door Assemblies
   3. CAN/ULC-S106 Standard Method of Fire Tests of Window and Glass Block Assemblies

H. ???Insert building code name used by authority having jurisdiction???.

2.03 DEFINITIONS

A. Manufacturer: A firm that produces primary glass, fabricated glass or framing as defined in referenced glazing publications.

2.04 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 (Reaffirmed 2020).

C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

D. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

E. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

F. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

G. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

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

2.05 SUBMITTALS

A. Comply with requirements of Section 01 33 00

B. Product Data: Submit manufacturer's technical data for each glazing material required, including installation and maintenance instructions.

C. Sustainable Requirements:
   1. Environmental Product Declaration (EPD)
      a. FireLite Plus monolithic glass for fire doors

D. Certificates of compliance from glass and glazing materials manufacturers attesting that glass and glazing materials furnished for project comply with requirements. Separate certification will not be required for glazing materials bearing manufacturer's permanent label designating type and thickness of glass, provided labels represent a quality control program involving a recognized certification agency or independent testing laboratory acceptable to authority having jurisdiction.

E. Product Test Listings: From UL indicating fire-rated glass complies with requirements, based on comprehensive testing of current product.

F. Samples: Submit, for verification purposes, approx. 8-inch by 10-inch sample for each type of glass indicated.

2.06 QUALITY ASSURANCE

A. Glazing Standards: FGMA Glazing Manual and Sealant Manual.

B. Fire Protective Rated Glass: Each lite shall bear permanent, non-removable label of UL certifying it for use in tested and rated fire protective assemblies.

C. Fire Protective Glazing Products for Door Assemblies: Products identical to those tested per UL 10B, classified and labeled by UL.

2.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials under provisions of Section 01 60 00

B. Deliver materials to specified destination in manufacturer or distributor's packaging, undamaged, complete with installation instructions.

C. Store off ground, under cover, protected from weather and construction activities.

2.08 WARRANTY

A. Provide manufacturer's limited warranty under provision of Section 01 78 00

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PART 2 PRODUCTS

3.01 MANUFACTURERS- (ACCEPTABLE MANUFACTURER/PRODUCTS)

A. Manufacturer: FireLite Plus® as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065 phone (800.426.0279) e-mail tgp.sales@allegion.com, web site http://www.fireglass.com

3.02 PERFORMANCE REQUIREMENTS

A. Fire-rated glass ceramic clear and wireless glazing material listed for use in impact safety-rated locations such as transoms and borrowed lites with fire rating requirements ranging from 20 to 90 minutes with required hose stream test.

B. Passes positive pressure test standards UL 10C.

3.03 MATERIALS-GLASS

A. Properties:
   1. FireLite Plus Standard Grade polished surface quality is comparable to alternative fire-rated ceramics that are marketed as having a premium finish. FireLite Plus Premium Grade is the industry leader for quality and is unmatched by alternative products or production methods. Both of its surfaces are ground and polished to provide superior surface quality, improving the overall clarity. The FireLite family of products feature ultraHD® Technology for superior color, clarity and surface quality.
   2. Thickness: 5/16 inch (7.94 mm) 0.31 inch (8 mm) overall.
   3. Weight: 4 lbs./sq. ft.
   4. Approximate Visible Transmission: 85 percent.
   5. Approximate Visible Reflection: 9 percent.
   6. Fire-rating: 20 minutes to 3 hours for doors; 20 minutes to 90 minutes for other applications.
   7. Impact Safety Resistance: ANSI Z97.1 and CPSC 16 CFR 1201 (Cat. I and II).
   8. STC Rating: Approximately 38 dB.
   9. Surface Finish:
      a. Standard Grade is polished for a surface quality that is comparable to alternative fire-rated ceramics marketed as having a premium finish.
      b. Premium Grade is finish ground and polished on both surfaces to provide superior surface quality, improving overall clarity and providing a surface that is unmatched by alternative products.
   10. Positive Pressure Test: UL 10C; passes.

B. Maximum sheet sizes based on surface finish:
   1. Premium: 48 inches (1219.2 mm) by 96 inches (2438.4 mm).
   2. Standard: 48 inches (1219.2 mm) by 96 inches (2438.4 mm).

C. Labeling: Permanently label each piece of FireLite Plus® with the FireLite Plus® logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the FireLite Plus® label only for sizes that exceed the listing (as approved by the local authority having jurisdiction).

D. Fire Rating: Fire rating classified and labeled by UL for fire rating scheduled at opening locations on drawings, when tested in accordance with ASTM E2010-01.

E. Substitutions: No substitutions allowed.

3.04 GLAZING COMPOUND FOR FIRE-RATED GLAZING MATERIALS

A. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent. Glass panels that exceed 1,393 sq. inches for 90-minute ratings must be glazed with fire-rated glazing tape supplied by manufacturer.

B. Glazing Compound: DAP 33 putty.

C. [Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Available Products:
   1. Dow Corning 795 - Dow Corning Corp.
   2. Silglaze-II 2800 - General Electric Co.
   3. Spectrem 2 - Tremco Inc.]

D. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

E. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

3.05 FABRICATION

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

PART 3 EXECUTION

4.01 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
   2. Minimum required face or edge clearances.
   3. Observable edge damage or face imperfections.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

C. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

4.02 INSTALLATION (GLAZING)

A. Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Set units of glass in each series with uniformity of pattern, draw, bow, and similar characteristics.

D. Cut glazing tape to length and set against permanent stops, flush with sight lines to fit openings exactly, with stretch allowance during installation.

E. Place setting blocks located at quarter points of glass with edge block no more than 6 inches (152.4 mm) from corners.

F. Glaze vertically into labeled fire-rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.

G. Place glazing tape on free perimeter of glazing in same manner described above.

H. Install removable stop and secure without displacement of tape.

I. Use specified glazing compound, without adulteration; bed glazing material in glazing compound; entirely fill all recess and spaces. Provide visible glazing compound with smooth and straight edges.

J. Install in vision panels in fire-rated doors to requirements of NFPA 80.

K. Install so that appropriate UL markings remain permanently visible.

4.03 PROTECTION AND CLEANING

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove any such substances by method approved by glass manufacturer.

B. Wash glass on both faces not more than four days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

4.04 GLAZING SCHEDULE

Rating	Assembly	Max. Exposed Area (Sq. In.)	Max. Width Of Exposed Glazing (In.)	OR	Max. Height Of Exposed Glazing (In.)	Stop Height
90 min.	Doors (non-temp rise)	2,034	36		56 ½”	3/4”
	Doors (temp rise)	100	12		33	1/2”
	Other than doors	2,627	56 ½”		56 ½”	5/8”
	HMS	2,627	56 ½”		56 ½”	3/4"
	Fireframes D.S.					

1. * HMS indicates hollow metal steel framing. Fireframes D.S. indicates Designer Series narrow profile framing. For wood frames, check with manufacturer for maximum tested glass sizes.

END OF SECTION

SECTION 090561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
   1. Resilient tile and sheet.
   2. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Preparation of existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
   1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

F. Preparation of existing wood-based subfloors for installation of new floor coverings.

1.02 REFERENCE STANDARDS

A. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.

B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

C. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2018.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

B. G.C. shall be responsible for testing concrete slab for moisture and alkalinity where new finishes are to be installed overtop of existing slab. Review testing reports for compatibility with finishes and adhesives and coordinate with Architect.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Visual Observation Report: For existing floor coverings to be removed.

C. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

D. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.
   2. Summary of conditions encountered.
   3. Moisture and alkalinity (pH) test reports.
   4. Copies of specified test methods.
   5. Recommendations for remediation of unsatisfactory surfaces.
   6. Submit report to Architect.
   7. Submit report not more than two business days after conclusion of testing.

E. Adhesive Bond and Compatibility Test Report.

F. Copy of RFCI (RWP).

1.05 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

C. Contractor's Responsibility Relating to Independent Agency Testing:
   1. Provide access for and cooperate with testing agency.
   2. Confirm date of start of testing at least 10 days prior to actual start.
   3. Allow at least 4 business days on site for testing agency activities.
   4. Achieve and maintain specified ambient conditions.
   5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.06 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 MATERIALS

A. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Existing concrete slabs (on-grade and elevated) with existing floor coverings:
      a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
      b. Removal of existing floor covering.
   2. Preliminary cleaning.
   3. Moisture vapor emission tests; 3 tests in the first 1000 square feet (100 square meters) and one test in each additional 1000 square feet (100 square meters), unless otherwise indicated or required by flooring manufacturer.
   4. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   6. Specified remediation, if required.
   7. Patching, smoothing, and leveling, as required.
   8. Other preparation specified.
   9. Adhesive bond and compatibility test.
   10. Protection.

B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that

adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.

3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION

SECTION 092116
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 wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

1.03 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data; 2017.

C. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

D. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

F. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

G. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

H. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

I. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

J. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2025.

K. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.

L. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2022.

M. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2020 (Reapproved 2024).

N. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

O. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2024.

P. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

Q. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019 (Reapproved 2024).

R. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

S. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

T. ASTM E413 - Classification for Rating Sound Insulation; 2022.

U. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

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

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:
   1. Provide data on metal framing, gypsum board, accessories, and joint finishing system.
   2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

C. Shop Drawings

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

C. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Shaft Walls at HVAC Shafts: Provide completed assemblies with the following characteristics:
   1. Air Pressure Within Shaft: Sustained 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. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Material and Product Requirements Criteria: AISI S201.

B. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.
   1. Structural Grade: As required to meet design criteria.
   2. Corrosion Protection Coating Designation: G40, or equivalent in accordance with AISI S220.

C. 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. Studs: C-shaped with knurled or embossed faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.

D. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified performance requirements.

E. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
   1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
   2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.

F. Non-structural Framing Accessories:
   1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
   2. Framing Connectors: ASTM A653/A653M G90 galvanized steel clips; secures cold rolled channel to wall studs for lateral bracing.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company; ____: www.americangypsum.com/#sle.
   2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
   3. Georgia-Pacific Gypsum; ____: www.gpgypsum.com/#sle.
   4. USG Corporation; ____: www.usg.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces, unless otherwise indicated.
   2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
   3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   4. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
      b. Ceilings: 5/8 inch (16 mm).

C. Backing Board For Wet Areas:
   1. Application: Surfaces in wet areas, including unit bathrooms and kitchens, coordinate with finish plans.
   2. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
      a. Regular Type: Thickness 5/8 inch (___ mm).
      b. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch (16 mm).
      c. Products, including, but not limited to, the following.
         1) CertainTeed Corporation; 5/8" GlasRoc Tile Backer Type X: www.certainteed.com/#sle.
         2) Georgia-Pacific Gypsum; DensShield Tile Backer: www.gpgypsum.com/#sle.
         3) Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Fire-Shield Tile Backer: www.goldbondbuilding.com/#sle.
         4) USG Corporation; Durock Brand Glass-Mat Tile Backerboard 5/8 in. (15.9 mm): www.usg.com/#sle.
         5) Substitutions: See Section 016000 - Product Requirements.

D. 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: Regular and Type X, in locations indicated.
   3. Type X Thickness: 5/8 inch (16 mm).
   4. Type C Thickness: 5/8 inch (19 mm).
   5. Regular Board Thickness: 5/8 inch (16 mm).
   6. Edges: Tapered.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 2 inches (50.8 mm).

B. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners. Installed at all right angled corridor walls

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Fiberglass Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners.
   2. Joint Compound: Setting type, field-mixed.

D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

E. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.
   1. Install studs at spacing required to meet performance requirements.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.

3.03 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C1007AISI 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 in all locations.
   2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall-mounted cabinets.

3.04 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.

3.05 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.06 INSTALLATION OF TRIM AND ACCESSORIES

A. Corner Beads: Install at external corners located in existing corridors or as indicated on Contract Documents, using longest practical lengths.

3.07 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   2. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

3.08 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Stone thresholds.

C. Ceramic trim.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

B. Section 090561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2024.

B. ANSI A118.6 - American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.

C. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2019.

D. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

E. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).

F. TCNA (HB-GP) - Handbook for Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs Installation; 2023.

G. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2025.

1.04 SUBMITTALS

A. See Section 013000 - 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. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Samples: Provide three finished tile samples to Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.06 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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile:
   1. Dal-Tile Corporation: www.daltile.com/#sle. Basis of design "Rekindle" RK14 24"x24". Coordinate with finish schedule and HACP.

2.02 TILE

A. Porcelain Tile, Type _____: ANSI A137.1 standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size: 2" by 2" inch (____by____ mm), nominal at bathrooms. 24" by 48" nominal at lobby.
   3. Thickness: 1/4" inch (_____ mm) at bathrooms. 3/8" at
   4. Color: As indicated on drawings.
   5. Trim Units: Matching bullnose, cove base, and cove shapes in sizes coordinated with field tile.

2.03 TRIM AND ACCESSORIES

A. Thresholds: Shluter "Reno-U" or sim.
   1. Thickness: thickness to fit application.

2.04 SETTING MATERIALS

2.05 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. High Performance Urethane Grout:
   1. Applications: Use where indicated on drawings and where no other type of grout is indicated.
   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. Products:
      a. LATICRETE International, Inc. Basis of design "SPECTRALOCK® 1" or sim urethane grout.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Standard Grout: ANSI A118.6 standard cement grout.
   1. Applications: Use where indicated on drawings.
   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. Products:
      a. Substitutions: See Section 016000 - Product Requirements.

2.06 MAINTENANCE MATERIALS

A. Tile Sealant: See Section 079200.

B. Tile Sealant: Gunnable, silicone, siliconized acrylic, modified silane polymer, 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.

C. Tile Sealer: Stain protection for porcelain tile tile.

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 that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.02 PREPARATION

A. Vacuum clean surfaces and damp clean.

B. Seal substrate surface cracks with filler.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds 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. Request tile pattern. 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. Install thresholds where floor finishes transition

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive.

H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

I. Grout tile joints unless otherwise indicated on drawings.

J. 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 - MORTAR BED METHODS

A. Over exterior concrete substrates, install in accordance with TCNA (HB) Method F101, bonded, with standard grout.

B. Waterproofing Membrane: Install as recommended by manufacturer and as specified in the section in which the product is specified.

C. Mortar Bed Thickness: 5/8 inch (15.9 mm), unless otherwise indicated on drawings.

3.05 CLEANING

A. Clean tile and grout surfaces.

3.06 PROTECTION

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

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).

C. 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.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2023.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Suspension Systems:
   1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
   2. Rockfon; ____: www.rockfon.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels, Type _____: Painted mineral fiber, with the following characteristics:
   1. Classification: ASTM E1264 Type A.
   2. Size: 24 by 24 inches (610 by 610 mm).
   3. Thickness: 3/4 inch (19 mm).
   4. Panel Edge: Square.
   5. Suspension System: Exposed grid.

2.03 SUSPENSION SYSTEMS

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.

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. Perimeter Moldings: Same metal and finish as grid.

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 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions, as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Install in bed of acoustical sealant.
   2. Use longest practical lengths.

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.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.05 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.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean surfaces.

C. Replace damaged or abraded components.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.02 REFERENCE STANDARDS

A. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2025.

B. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s); 2025.

C. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).

1.03 SUBMITTALS

A. See Section 013000 - 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. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Verification Samples: Submit two samples, 4 by 4 inch (___ by ___ mm) in size illustrating color and pattern for each resilient flooring product specified.

F. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Luxury Vinyl Tile - Type Per finish schedule: _____.
   1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
   2. Size: 6" by 48" inch (___ by ___ mm).
   3. Thickness: 0.125 inch (3.2 mm).
   4. Color: As indicated on drawings.

2.02 RESILIENT BASE

A. Resilient Base: ASTM F1861, Type TP, rubber, thermoplastic; style as scheduled.
   1. Height: 4 inches (100 mm).
   2. Thickness: 0.125 inch (3.2 mm).
   3. Finish: Satin.
   4. Color: As indicated on drawings.
   5. Accessories: Premolded external corners and internal corners.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

B. Moldings, Transition and Edge Strips: Same material as flooring.

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. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 090561.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 090561.

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. Fit joints and butt seams tightly.
   2. Set flooring in place, press with heavy roller to attain full adhesion.

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.

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.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 099123
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, including the following:
   1. All interior drywall surfaces
   2. Exposed concrete ceilings
   3. 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.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 321723 - Pavement Markings: Painted pavement markings.

1.03 REFERENCE STANDARDS

A. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

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 013000 - 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 fc (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.

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. Supply each paint material in quantity required to complete entire project's work from a single production run.
   4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Flammability: Comply with applicable code for surface burning characteristics.

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: As indicated on drawings.
   1. Selection to be made by Architect after award of contract.
   2. In all areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted. Unless otherwise noted on the drawings. In mechanical rooms pipes, conduit, ducts, and flues to be finished per HACP mechanical room insulation color schemes shown on sheet A506.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and Conduit.
   1. Two top coats and one coat primer.

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.
   2. Two top coats and one coat primer.

3. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Alkali Resistant Water Based Primer; MPI #3.
   2. Interior Latex Primer Sealer; MPI #50.
   3. Interior Drywall Primer Sealer.
   4. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
   5. Interior Water Based Primer for Galvanized Metal; MPI #134 or #134 X-Green.

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. Test shop-applied primer for compatibility with subsequent cover materials.

E. 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. Plaster and Stucco: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. 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. Masonry:

H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

I. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.

J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

K. Galvanized Surfaces:

L. 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.

M. 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.

N. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

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 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 101419
DIMENSIONAL LETTER SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dimensional letter signage.

1.02 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of dimensional letter sign, indicating style, font, colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, and attachment details.

D. Samples: Submit one sample of each type of dimensional letter sign of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where materials, colors, and finishes are not specified, submit two sets of selection charts or chips.

1.04 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 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.

2.02 DIMENSIONAL LETTERS

A. Applications: Building identification.
   1. Use individual metal letters.
   2. Mounting Location: Exterior as indicated on drawings.

B. Metal Letters:
   1. Material: Stainless steel sheet, fabricated reverse channel.
   2. Thickness: Manufacturer's standard for letter size.
   3. Letter Height: 9 inches (_____ mm).
   4. Text and Typeface:
      a. Character Font: Helvetica, Arial, or other sans serif font.
      b. Character Case: Upper case only.
   5. Finish: Anodized.
   6. Color: As selected.
   7. Mounting: Projected mount with collars.

2.03 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

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 dimensional letter signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until 5 years post-substantial completion; repair or replace damaged items.

END OF SECTION

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protective corridor handrails.

B. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 055213 - Pipe and Tube Railings: Metal railings not intended to protect walls..

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2026.

C. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2021.

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).

F. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.

C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.

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.

PART 2 PRODUCTS

2.01 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.

2.02 PRODUCT TYPES

A. Protective Corridor Handrails: Factory- or shop-fabricated, with preformed end caps and internal and external corners:
   1. See Section 055213 for metal railings not intended to protect walls.
   2. Comply with accessibility requirements of ICC A117.1 and ADA Standards.
   3. Performance of Installed Assembly:
      a. Support vertical live load of 100 lb/lineal ft (1,400 N/m) with deflection not to exceed 1/50 of span between supports.
   4. Mounting: Surface.
   5. Projection From Wall to Outside of Rail: 4 inch (____ mm)maximum.
   6. Return rail to wall.

B. Corner Guards - Surface Mounted:
   1. Material: High impact vinyl with full height extruded aluminum retainer.
   2. Performance: Resist lateral impact force of 100 lbs (445 N) at any point without damage or permanent set.
   3. Width of Wings: 2 inches (51 mm).
   4. Corner: Square.
   5. Color: As selected from manufacturer's standard colors.
   6. Length: One piece.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

3.02 INSTALLATION

A. Position top of corridor hand rail 36 inches (914 mm) from finished floor.

B. Position corner guard 4 inches (102 mm) above finished floor to 60 inches high (____ mm high).

C. Terminate rails 1 inch (25.4 mm) short of door openings and intersecting walls.

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch (6 mm).

3.04 CLEANING

A. See Section 017419 - 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 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Residential toilet, shower, and bath accessories.

B. Utility room accessories.

1.02 RELATED REQUIREMENTS

A. Section 093000 - Tiling: Ceramic washroom accessories.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 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.

2.02 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.03 RESIDENTIAL TOILET, SHOWER, AND BATH ACCESSORIES

A. Decorative Aluminum Grab Bars: Smooth surface.
   1. Push/Pull Point Load: 250 pound-force (1112 N), minimum.
   2. Dimensions: 1.6 inch (40.6 mm) outside diameter, minimum 0.080 inch (2 mm) wall thickness, bracket, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
   3. Length and Configuration: As indicated on drawings.

B. Medicine Cabinet: Metal cabinet, shelves, and door; surface mounted.
   1. Overall Size: As indicated on drawings.
   2. Cabinet Construction: Heavy-gauge steel, factory-applied, gloss white, baked-enamel finish. Form body in one piece, without seams, and with rounded inside corners.
   3. Shelves: Adjustable, glass; provide not less than three shelves.
   4. Door Type: Mirror with satin finish stainless steel frame.
   5. Single Door: Fitted with continuous piano-type hinge, shock-absorbing spring-and-rod door stop, magnetized catch, right-hand swing, reversible type.

C. Toilet Paper Holder: Recess mounted, single roll, concealed attachment.
   1. Material: Stainless steel; satin finish.
   2. Type: Spring-loaded spindle with brackets.

D. Towel Bar: Square tubular bar; rectangular mounting posts, concealed attachment.
   1. Mounting Post Material: Stainless steel; bright polished finish.
   2. Bar Material: Stainless steel; bright polished finish.
   3. Length: 18 inches (460 mm).

E. Shower Curtain Rod: Straight tube, 1 inch (25 mm) diameter, with mounting flanges for concealed attachment.
   1. Material: Stainless steel; bright polished finish.
   2. Length: 72 inches (1830 mm). Coordinate with shower enclosure

F. Shower Curtain: Mildew resistant fabric with corrosion resistant metal grommets.

1. Material: Nylon, machine washable.
2. Color: White.
3. Shower Curtain Hooks: Chrome-plated spring wire.
4. Size: 36 by 72 inches (914 by 1830 mm), hemmed edges. Coordinate with shower enclosure

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.

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.
   1. Grab Bars: As indicated on drawings.
   2. Other Accessories: As indicated on drawings.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 102819
TUB AND SHOWER ENCLOSURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tub and shower surrounds.

1.02 RELATED REQUIREMENTS

A. Section 224017 - Bathtubs and Showers.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's literature for enclosure.

C. Shop Drawings: Indicate layout, dimensions, identification of components, and interface with adjacent construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tub and Shower Enclosures:
   1. Accessibility Professionals; Freedom ADA Roll-In Shower: www.accessibilitypro.com/#sle. Or equal

2.02 TUB AND SHOWER SURROUNDS

A. Description: Fiberglass panels over continuous substrate; installed in alcove above shower receptor or tub; available as individual panels or as kits.
   1. See Section 224017 for bathtubs and shower receptors.
   2. Panel Thickness: Thickness varies; 0.225 inch (5.7 mm) thick, minimum.

B. Configuration and Dimensions: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Do not begin installation until supports and adjacent substrates are complete.

C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Clean substrates thoroughly prior to installation.

B. Prepare substrates as recommended by the manufacturer.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings.

B. Fit and align tub and shower enclosure level and plumb.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Verify enclosure does not leak while shower is running and door is fully closed and catch is engaged.

3.05 ADJUSTING

A. Adjust tub and shower enclosure doors to operate smoothly.

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove protective film and temporary stickers from exposed metal and glass surfaces.

C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

3.08 PROTECTION

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 104300
EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Automated external defibrillator (AED) cabinets.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide AED operational features, color and finish, anchorage details, and installation instructions.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Automated External Defibrillators (AEDs):
   1. Philips Medical Systems: www.usa.philips.com/#sle.
   2. Stryker Corporation; HeartSine samaritan PAD 350P Defibrillator - PAD 350p: or E.Q www.stryker.com/#sle.

2.02 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS)

A. Automated External Defibrillators (AEDs)
   1. General Contractor to provide three (3) automated external defibrillators (AEDs) with locations to be selected by owner.

2.03 EMERGENCY AID CABINETS

A. Type: Automated external defibrillator (AED).

B. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

C. Fire-Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8 inch (15.9 mm) thick fire barrier material.

D. Cabinet Configuration: Recessed type.
   1. Size to accommodate AED.

E. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with wire pull handle and nylon catch. Hinge door for 180 degree opening with two butt hinges.

F. Door Glazing: Acrylic plastic, clear, 1/8 inch (3 mm) thick, flat shape and set in resilient channel glazing gasket.

G. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

H. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

I. Finish of Door Pull or Handle: Stainless steel.

J. Finish of Cabinet Interior: White powder coat.

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 AEDs in cabinets.

D. Cabinet Lettering:
   1. Location: Face of door framing.
   2. Apply lettering on field-painted cabinets after painting is complete and has been accepted.
   3. Apply lettering on factory-finished cabinets either at the factory or just prior to Substantial Completion.

3.03 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust cabinet doors to operate smoothly without binding. Verify that alarms and integral locking devices operate properly.

C. On completion of cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes. Replace cabinets that cannot be restored to factory-finished appearance. Use materials and procedures recommended by cabinet manufacturer.

3.04 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Demonstrate proper operation of AED to Owner's designated representative.

END OF SECTION

1

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking.

B. Section 099123 - Interior Painting.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers; 2026.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguisher Cabinets and Accessories:
   1. Potter-Roemer; FRC1404: www.potterroemer.com/#sle.

2.02 FIRE EXTINGUISHERS

A. General Requirements: 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 on drawings.

B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C.
   2. Size: 10 lb (4.54 kg).
   3. Finish: Baked polyester powder coat; color as selected by Architect.
   4. Temperature Range: Minus 65 to 120 degrees F (Minus 54 to 49 degrees C).

2.03 FIRE EXTINGUISHER CABINETS

A. Fire-Rated Cabinet Construction: One-hour fire rated.
   1. Steel; double wall or outer and inner boxes with 5/8-inch (16 mm) thick fire barrier material.

B. Cabinet Configuration: Recessed type.
   1. Size to accommodate accessories.
   2. Trim: Flat square edge, with 2-inch (51 mm) wide face.

C. Door: 20-gauge, 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: Acrylic plastic, clear, 1/8 inch (3 mm) thick, flat shape, and set in resilient channel glazing gasket.

E. Cabinet Mounting Hardware: Appropriate to cabinet, with predrilled holes for placement of anchors.

F. Fabrication: Weld, fill, and grind components smooth.

G. Finish of Cabinet Exterior Trim and Door: Primed for field paint finish.
   1. See Section 099123 for field painting.

H. Finish of Cabinet Interior: White colored enamel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and interfaces with other work.

B. Verify substrate and site conditions for product installation are in accordance with manufacturer's written instructions.

C. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

D. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 42 inches (1067 mm) from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.
   1. See Section 061000 for in-wall blocking requirements.

D. Place extinguishers and accessories in cabinets.

E. Position cabinet signage at left of cabinet.

3.03 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Provide separate maintenance contract for specified maintenance service.

END OF SECTION

1

SECTION 105613
METAL STORAGE SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Four post shelving.

B. Case type shelving.

C. Case type cabinets.

1.02 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Rated uniform shelf loads.
   2. Details of shelving assemblies, including reinforcement.
   3. Accessories.
   4. Substrate preparation instructions and recommendations.
   5. Storage and handling requirements and recommendations.
   6. Installation methods.
   7. Specimen warranty.
   8. Maintenance methods.

C. Test Reports: Provide independent agency test reports documenting compliance with specified structural requirements.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and finishes.

E. Executed warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Inspect for dents, scratches, or other damage. Replace damaged units.

B. Store in manufacturer's unopened packaging until ready for installation.

C. Store under cover and elevated above grade.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty for rust, corrosion, and manufacturing defects. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 SHELVING - GENERAL

A. See drawings for layout and sizes.

B. Anchors: Provide anchoring hardware to secure each shelving unit to floor and wall.
   1. Provide hardware of type recommended by manufacturer for substrate.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate is level and that clearances are as specified.

B. Verify that walls are suitable for shelving attachment.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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. Install in accordance with manufacturer's instructions.

B. Anchor and reinforce as specified, as indicated on drawings, and as recommended by manufacturer.

C. Install shelving with shelf surfaces level and vertical supports plumb; adjust feet and bases as required.

D. Out-Of-Square Tolerance - Four Post Shelving: Maximum of 1/8 inch (3 mm) difference in distance between bottom shelf and canopy top, measured along any post in any direction.

3.04 CLEANING

A. Clean shelving and surrounding area after installation.

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

1

SECTION 105723
CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted wire closet shelving.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wire Storage Shelving:
   1. ClosetMaid Corporation; Fixed Wire Shelving: Shelf & Rod 12", White. www.closetmaidpro.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect areas to receive shelving or storage system, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.

B. Verify appropriate fastening hardware.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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. Install wire shelving in accordance with manufacturer's instructions, with shelf surfaces level.

B. Cap exposed ends of cut wire shelving.

C. Install wire shelving back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.

3.04 CLEANING

A. Clean soiled surfaces after installation.

3.05 PROTECTION

A. Protect installed work from damage.

B. Touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION

1

SECTION 108213
EXTERIOR GRILLES AND SCREENS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior aluminum grilles and screens attached to structure.

1.02 REFERENCE STANDARDS

A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2021.

B. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2024.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Submit detailed shop drawings, indicating component profiles, sections, finishes, fastening details, special details, and manufacturer's technical and descriptive data.
   1. Include field dimensions of openings and elevations on shop drawings.
   2. Indicate distinction between factory-assembled and field-assembled work on shop drawings.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original, unopened packaging, with labels clearly identifying manufacturer and material.

B. Store materials indoors, protected from moisture, humidity, and extreme temperature fluctuations.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a one year period after Date of Substantial Completion.

C. Finish Warranty: Provide manufacturer's ten year warranty on factory finish against cracking, peeling, and blistering.

PART 2 PRODUCTS

2.01 GRILLES

A. Aluminum Grilles: Provide shop fabricated, shop finished grilles assembled into panels.
   1. Panel Size and Configuration: As indicated on drawings.
   2. Frame/Support: Extruded aluminum tube or flat aluminum bar.

2.02 FABRICATION

A. Shop fabricate grilles and screens to the greatest extent possible.

B. Disassemble as necessary for shipping and handling, clearly mark units for proper reassembly.

C. Provide supports, anchorages, and accessories as required for complete assembled system.

D. Provide inserts as required for installation into concrete or masonry based support materials.

E. Fabricate grilles to ensure proper fit into openings of sizes indicated, with tolerances for installation.

F. Attach grille panels to each other by welding, unless otherwise indicated.

2.03 FINISHES

A. Finish Color: As selected by Architect from manufacturer's standard color range.

2.04 ACCESSORIES

A. Fasteners: ASTM F593 stainless steel or ASTM A307 carbon steel, sizes to suit installation conditions.

B. Anchors and Inserts: Corrosion resistant; type, size, and material required for loading and installation as indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that painting, roofing, masonry work, and other adjacent work that might damage grille finish have been completed prior to start of installation.

C. Verify that anchorage devices have been properly installed and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint, and allow paint to dry prior to installation of aluminum components.

C. Set grilles level, plumb, with uniform joints, and in alignment with adjacent work as indicated.

D. Mechanically secure grilles to supporting structure.

E. Do not cut or trim aluminum members without approval of manufacturer; do not install damaged members.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/8 inch (3 mm).

3.04 CLEANING

A. Remove temporary protective covering as grilles are installed.

B. Clean finished surfaces as recommended by manufacturer and maintain clean condition until Date of Substantial Completion.

C. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

D. Replace grilles that have been damaged beyond touch-up repair.

3.05 PROTECTION

A. Protect installed grilles to ensure grilles are without damage until Date of Substantial Completion.

END OF SECTION

SECTION 122113
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. WCMA A100.1 - Standard for Safety of Window Covering Products; 2022.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

PART 2 PRODUCTS

2.01 BLINDS WITHOUT SIDE GUIDES

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Plastic Slats: PVC foam, square slat corners.
   1. Width: 2 inch (50 mm).
   2. Color: As selected by Architect.
   3. Texture: Smooth.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   1. Color: Same as slats.

F. Bottom Rail: Pre-finished, formed steel; with end caps.
   1. Color: Same as headrail.

G. Lift Cord: Braided nylon, continuous loop with restraining device; comply with WCMA A100.1.
   1. Free end weighted.
   2. Color: As selected by Architect.

H. Control Wand: Extruded hollow plastic; hexagonal shape.
   1. Non-removable type.
   2. Length of window opening height less 3 inch (76 mm).
   3. Color: Clear.

I. Headrail Attachment: Wall brackets.

2.02 FABRICATION

A. Determine sizes by field measurement.

B. Fabricate blinds to cover window frames completely.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed. See Section 061000.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch (6 mm).

B. Maximum Offset From Level: 1/8 inch (3 mm).

3.04 ADJUSTING

A. Adjust blinds for smooth operation.

3.05 CLEANING

A. Clean blind surfaces just prior to occupancy.

B. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

SECTION 123530
RESIDENTIAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen cabinets.

B. Kitchen countertops.

C. Vanity cabinets.

D. Vanity countertops.

1.02 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. BHMA A156.9 - Cabinet Hardware; 2020.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

E. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets; 2022.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, configurations, construction details, and joint details.

C. Certificate: Submit Kitchen Cabinet Manufacturers Association (KCMA) certificate showing conformance with KCMA A161.1.

D. Shop Drawings: Indicate casework locations, elevations, clearances required, rough-in and anchor placement dimensions and tolerances. GC to field verify existing dimensions and coordinate with casework supplier.

E. Cabinet Finish Sample: Submit two samples of each type of finish, 2 inches by 3 inches (51 mm by 75 mm) in size, illustrating color, texture, gloss, and wood species.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 CABINETS

A. Manufacturers: Contractor's Option meeting performance specifications. Refer to documents for basis of design.

B. Kitchen and Vanity Cabinets: Premanufactured and factory-finished, complying with construction and testing requirements i AWI Custom Grade

C. Cabinet Box: Frameless construction.
   1. Side Panels: Plywood.
      a. Exposed Side Panel Finish: Plastic laminate, coordinate with cabinet door and drawer color/finish.
   2. Back Panel: Plywood.
   3. Bottom (and Top) Panel: Plywood.
   4. Interior Cabinet Finish: Thermally fused laminate.

D. Cabinet Door/Drawer Configuration: Full overlay.

E. Cabinet Doors:
   1. Particle board or medium density fiberboard (MDF), wood veneer finish.

2. Species: Birch.
3. Stain Color: Pecan.

F. Drawers:
1. Drawer Front: To match cabinet doors in style, material, and finish.
2. Interior Finish: Manufacturer's standard.

G. Shelves: Manufacturer's standard adjustable shelves and shelf supports.

H. Cabinet Hardware: As selected from manufacturer's standard types, styles and finishes.
1. Comply with BHMA A156.9.
2. Drawer and Cabinet Pulls: Wire.
3. Hinges: Manufacturer's standard Soft Close concealed hinges.
4. Drawer Slides: Manufacturer's standard Soft Close drawer slides.

I. Kitchen Countertop: Post formed plastic laminate over particle board, coved to back splash.

J. Vanity Countertop: Post formed plastic laminate over particle board, coved to back splash.

2.02 MATERIALS

A. Wood-Based Materials:
1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.

B. Hardwood Plywood: Veneer core; HPVA HP-1 Grade as indicated; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.

C. Particleboard: Composed of wood chips, medium density, with waterproof resin binders; of grade to suit application; sanded faces; complying with ANSI A208.1.

D. Medium Density Fiberboard (MDF): Composed of cellulosic fibers and resin cured under heat and pressure; grade to suite application; complying with ANSI A208.2.

E. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

F. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

2.03 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate corners and joints without gaps.

C. Fabricate each unit to be rigid and not dependent on adjacent units for rigidity.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of support framing. Provide supplemental support as needed to ensure upper and lower cabinets are properly secured.

3.02 INSTALLATION

A. Install casework, components and accessories in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered.

C. Set casework items plumb and square, securely anchored to building structure.

3.03 ADJUSTING

A. Adjust doors, drawers, hardware, and other moving or operating parts to function smoothly.

3.04 CLEANING

A. Clean casework, countertops, shelves, and hardware.

3.05 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for manufactured casework.

1.02 RELATED REQUIREMENTS

A. Section 123530 - Residential Casework.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2022.

B. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. PS 1 - Structural Plywood; 2023.

1.04 SUBMITTALS

A. See Section 013000 - 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. Verification Samples: For each finish product specified, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

F. Installer's qualification statement.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 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.

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: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. 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. NSF approved for food contact.
      c. Surface Color and Pattern: As indicated on drawings.
   2. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch (32 mm) thick with radiused edge, integral coved backsplash with radiused top edge.
   3. Back and End Splashes: Same material, same construction.

2.02 MATERIALS

A. 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.

B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf (20 kg/cu m) minimum density; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

C. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

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.

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 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. Seal joint between back/end splashes and vertical surfaces.

3.03 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet (3 mm in 3 m), maximum.

B. Offset From Wall, Countertops: 1/8 inch (3 mm) maximum; 1/16 inch (1.5 mm) minimum.

C. Field Joints: 1/8 inch (3 mm) wide, maximum.

3.04 CLEANING

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 149100
FACILITY CHUTES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Trash chutes.

B. Chute maintenance.

1.02 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for additional requirements.

B. Product Data: Manufacturer's printed data sheets on each component, indicating which options are provided.

C. Shop Drawings: Provide shop drawings for the following:
   1. Chute door replacement.

D. Maintenance Contract.

E. Executed warranty.

1.04 QUALITY ASSURANCE

A. See Section 014000 - Quality Requirements for additional requirements.

B. Products Requiring Electrical Connection: Listed and classified by UL (DIR), ITS (DIR), or testing agency acceptable to authorities having jurisdiction as suitable for indicated purpose being specified.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for facility chutes. Complete forms in Owner's name and register with manufacturer.

C. Installer Warranty: Provide 2-year warranty for facility chutes commencing on Date of Substantial Completion. Complete forms in Owner's name and register with installer.

D. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Facility Chutes:
   1. CHUTES International; Intake Door - Bottom Hinged 21x18, Rubbish Trim: www.chutes.com/#sle.

2.02 FACILITY CHUTES

A. Trash Chutes: Existing to Remain. New Door Only.
   1. Intake Doors: Bottom-hinged, self-closing and self-latching, with no locks.
   2. Intake Door Size: 21 inches wide by 18 inches high (533 mm wide by 457 mm high), nominal.
   3. Intake Door Operator: Latch handle that unlatches and opens door.
      a. Locate highest component used for door operation lower than 48 inches (1220 mm) above finished floor.
      b. Provide latch handle with shape that is easy to grasp with one hand, does not require tight grasping or pinching, or twisting of wrist to operate.

2.03 COMPONENTS

A. Chute Intake Doors: Factory-assembled, UL (DIR) listed and labeled door and frame, with self- or automatic-closing and positive latching; frame designed for chase construction, and flush-mounted.
   1. Material: Stainless steel, brushed or satin finish.
   2. Fire Rating: 1-1/2 hours.

B. Chute Access Doors: Provide same construction and fire rating as chute intake doors with locks; provide wherever equipment requiring maintenance is located inside chute, including sprinklers, plumbing, and electrical connections.

C. Chute Intake and Access Door Locks: Mortise or rim cylinder locks keyed alike; key removable only when door is locked.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor to floor and other applicable dimensions are in accordance with approved shop drawings.

3.02 INSTALLATION

A. Install facility chutes and equipment in accordance with NFPA 82, requirements of local authorities having jurisdiction (AHJ), and manufacturer's instructions.

B. Maintain fire-resistive capacity of enclosing walls.

C. Adjust doors and other operating components for smooth operation.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Test facility chute components for proper operation.
   1. Operate doors, locks, and interlocks.

3.04 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. After completion of enclosing walls, clean exposed facility chute components; do not remove testing agency labels.

3.05 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Provide service and maintenance of facility chute and equipment for one year from Date of Substantial Completion.

END OF SECTION

1

SECTION 210500
COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Expansions - hose and braid.

D. Mechanical couplings.

E. Pipe hangers and supports.

F. Pipe sleeves.

G. Pipe sleeve-seal systems.

H. Piping specialties.

I. Pressure gauges.

J. Pressure relief valves.

K. Retrofit-sprinkler piping cover system.

1.02 RELATED REQUIREMENTS

A. Section 211200 - Fire-Suppression Standpipes: Standpipe design.

B. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2025).

B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

D. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2024.

E. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded; 2021.

F. ASME B16.25 - Buttwelding Ends; 2022.

G. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2022.

H. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.

I. 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; 2025, with Errata.

J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

K. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.

L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.

M. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.

N. ASTM A536 - Standard Specification for Ductile Iron Castings; 2024.

O. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.

P. AWWA C606 - Grooved and Shouldered Joints; 2022.

Q. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2024.

S. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements 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. Manufacturer's qualification statement.

E. Installer's qualification statement.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver and store valves in shipping containers, with labeling in place.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Combined Sprinkler, Standpipe, and Hose System:
   1. Comply with NFPA 13 and NFPA 14.
   2. See Sections 211300 and 211200.

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 10, ASME B36.10M Schedule 5, ASTM A53 Schedule 40, ASTM A135/A135M Schedule 10, ASTM A135/A135M UL listed light wall type, or ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.9 wrought steel, buttwelded, ASME B16.25 buttweld ends, ASTM A234/A234M wrought carbon steel or alloy steel, ASME B16.5 steel flanges and fittings, or ASME B16.11 forged steel socket welded and threaded.

2.03 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.

2.04 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
   1. Elastomer-based interlocking links to 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 with service requirements.
   4. Service Requirements:
      a. Corrosion resistant.
      b. Underground, buried, and wet conditions.
   5. Glass-reinforced plastic pressure end plates.

B. Wall Sleeve: PVC material with waterstop collar, and nailer end caps.

C. Sleeve-Forming Disk: Nonconductive plastic-based material, 3 inch (76.2 mm) thick.

D. Pipeline-Casing Seals:
   1. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

2.05 ESCUTCHEONS

A. Material:
   1. Grade TP304, seamless tube, ASTM A269/A269M stainless steel.
   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 (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

2.07 EXPANSION JOINTS AND LOOPS - HOSE AND BRAID

A. Provide flexible loops with two flexible sections of hose and braid, two 90-degree elbows, and 180-degree return with support bracket and air release or drain plug.

B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.

C. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
   1. Maximum Allowable Working Pressure: 150 psig (1030 kPa) at 120 degrees F (49 degrees C).
   2. Accommodate the Following:
      a. Axial Deflection in Compression and Expansion: 2 inch (_____ mm).
      b. Lateral Movement: 1 inch (_____ mm).
      c. Angular Rotation: 15 degrees.
      d. Force developed by 1.5 times specified maximum allowable operating pressure.
   3. End Connections: Same as specified for pipe jointing.
   4. Provide necessary accessories including, but not limited to, swivel joints.

2.08 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig (2065 kPa).
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
   4. Housing Coating: Factory applied orange enamel.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).

6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.09 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.

B. Backflow Preventer: Reduced-pressure principle valve assembly backflow preventer with drain and OS & Y gate valve on each end.

C. Commercial Riser Manifold: Preassembled and tested riser manifold in accordance with NFPA 13.

D. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.

2.10 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
   1. Diameter: 4-1/2 inch (115 mm).
   2. Mid-Scale Accuracy: One percent.

2.11 PRESSURE RELIEF VALVES

A. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.

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.

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 (15 mm) space between finished covering and adjacent work.
   2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   3. Use hangers with 1-1/2 inch (40 mm) 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.

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. Structural Considerations:
   1. Do not penetrate building structural members unless indicated.

J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

K. Manufactured 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. 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.

M. 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.

C. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 211300
FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

C. Fire department connections.

1.02 REFERENCE STANDARDS

A. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

B. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 1963 - Standard for Fire Hose Connections; 2019.

D. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements 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.
   3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.

1.05 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site.

B. Comply with FM (AG) requirements.

C. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas noted.

B. Occupancy: Residential, Comply with NFPA13.

C. Water Supply: Determine volume and pressure from water flow test data.

1. Revise design when test data available prior to submittals.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Concrete Screw Type Anchors: Complying with ICC-ES AC193.

2.02 SPRINKLERS

A. Suspended Ceiling Type: Concealed pendant type with matching push on cover plate.
   1. Response Type: Quick.
   2. Coverage Type: Standard.
   3. Finish: Chrome plated.
   4. Cover Plate Finish: Enamel, color white.
   5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

2.03 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Replaceable internal components without removing valve from installed position.

B. Fire Department Connections:
   1. Type: Free standing made of corrosion resistant metal complying with UL 405.
      a. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
      b. Sleeve: Brass, 18 inches (460 mm) height.
      c. Signage: Raised or engraved lettering 1 inch (25.4 mm) minimum indicating system type.

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 entire piping system of foreign matter.

G. Hydrostatically test entire system.

H. Require test be witnessed by Fire Marshal.

END OF SECTION

SECTION 220517
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

C. Above-grade flashing panels.

1.02 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

B. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

A. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.

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 (25 mm) greater than external pipe diameter.
   3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.02 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:

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 with service requirements.
4. Service Requirements:
    a. Corrosion resistant.
    b. Oil, fuel, gas, and solvent resistant.
    c. Fire Resistant: 1 hour, UL (DIR) approved.
    d. High Temperature, up to 400 degrees F (204 degrees C).
    e. Low temperature, down to minus 67 degrees F (minus 55 degrees C).
5. Glass-reinforced plastic pressure end plates.

B. Sealing Compounds:
1. Provide packing and sealing compound to fill pipe to sleeve thickness.
2. Combined packing and sealing compounding to match partition fire-resistance hourly rating.

C. Pipe Sleeve Material:
1. Bearing Walls: Steel, cast iron, or terra-cotta pipe.
2. Masonry Structures: Sheet metal or fiber.

D. Wall Sleeve: PVC material with waterstop collar, and nailer end-caps.

E. Sleeve-Forming Disk: Non-conductive plastic-based material, 3 inch (76.2 mm) thick.

F. Pipeline-Casing Seals:
1. Coated boltless casing-spacer for 4 inch (100 mm) carrier pipe.
2. Coated boltless modular seal for 6 inch (150 mm) carrier pipe.
3. Carbon steel band with risers for 12 inch (305 mm) carrier pipe.
4. End Seals: 1/8 inch (3.1 mm), pull-on type, rubber or synthetic rubber based.

2.03 ABOVE-GRADE FLASHING PANELS

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured panel with elastomeric collar to seal around piping; select according to piping and facade materials installed.

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.

3.02 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. Inserts:

E. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

F. Manufactured 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 water-tight seal.
6. Install in accordance with manufacturer's recommendations.

G. 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 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.

C. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

END OF SECTION

SECTION 220719
PLUMBING PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Painting insulation jacket.

1.03 REFERENCE STANDARDS

A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - 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 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturers:
   1. Armacell LLC; AP ArmaFlex: www.armacell.us/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: Minus 40 degrees F (Minus 40 degrees C).
   2. Maximum Service Temperature: 220 degrees F (104 degrees C).
   3. Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

C. Exposed Piping: Locate insulation and cover seams in least visible locations.

D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

END OF SECTION

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary waste piping, above grade.

B. Domestic water piping, above grade.

C. Storm drainage piping, above grade.

D. Natural gas piping, buried within 5 feet (1500 mm) of building.

E. Natural gas piping, above grade.

F. Pipe flanges, unions, and couplings.

G. Pipe hangers and supports.

H. Ball valves.

1.02 REFERENCE STANDARDS

A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

B. ASME B31.1 - Power Piping; 2024.

C. ASME B31.9 - Building Services Piping; 2025.

D. 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; 2025, with Errata.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

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; 2025.

H. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).

I. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2025.

J. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2024.

K. 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).

L. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).

M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

N. ASTM F437 - Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2024.

O. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2023.

P. ASTM F439 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2024.

Q. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2023.

R. ASTM F442/F442M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR); 2023.

S. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2022.

T. AWWA C606 - Grooved and Shouldered Joints; 2022.

U. AWWA C651 - Disinfecting Water Mains; 2023.

V. IAPMO IGC 361 - Continuous Flexible Self-Plunging Waste Pipes; 2019.

W. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

X. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

Y. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

Z. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

AA. NSF 61 - Drinking Water System Components - Health Effects; 2024.

BB. NSF 372 - Drinking Water System Components - Lead Content; 2024.

CC. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - 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. Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.

D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

E. Project Record Documents: Record actual locations of valves.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.

1.04 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.

E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.06 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, solder, and flux (if used), complying with NSF 61 and NSF 372; label pipe and fittings.

B. Plenum-Installed Piping: Provide piping with flame spread index of 25 or less and smoke developed index of 50 or less when tested in accordance with ASTM E84 or UL 723.

2.02 SANITARY WASTE PIPING, ABOVE GRADE

A. Continuous Flexible Self-Plunging Waste Pipes: IAPMO IGC 361, provide to connect lavatories and sink tail piece to PVC sanitary waste piping.

B. PVC Pipe: ASTM D2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.03 DOMESTIC WATER PIPING, ABOVE GRADE

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.

2.04 STORM DRAINAGE PIPING, ABOVE GRADE

A. PVC Pipe: ASTM D2665.
   1. Fittings: PVC.
   2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.05 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.
   1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
   2. Joints: Threaded or welded to ASME B31.1.

2.06 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch (80 mm, DN) and Under:
   1. Ferrous Pipe: Class 150 malleable iron threaded unions.

B. Flanges for Pipe Sizes Over 1 inch (25 mm, DN):

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 or ductile iron, galvanized.
   3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.07 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 (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
   3. Wall Support for Pipe Sizes to 3 inch (80 mm, DN): Cast iron hook.
   4. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Over: Welded steel bracket and wrought steel clamp.
   5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

C. Plumbing Piping - Water:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm, DN): Malleable iron, adjustable swivel, split ring.
   2. Hangers for Cold Pipe Sizes 2 inch (50 mm, DN) and Over: Carbon steel, adjustable, clevis.
   3. Hangers for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Adjustable steel yoke, cast iron pipe roll, double hanger.
   4. Wall Support for Pipe Sizes Up to 3 inch (80 mm, DN): Cast iron hook.
   5. Wall Support for Pipe Sizes 4 inch (100 mm, DN) and Larger: Welded steel bracket and wrought steel clamp.
   6. Wall Support for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
   7. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Floor Support for Hot Pipe Sizes to 4 inch (100 mm, DN): Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
   9. Floor Support for Hot Pipe Sizes 6 inch (150 mm, DN) and Larger: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.

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. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.

2.08 BALL VALVES

A. Construction, 4 inch (100 mm, DN) and Smaller: MSS SP-110, Class 150, 400 psi (2760 kPa) 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 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Group piping whenever practical at common elevations.

F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

H. Provide access where valves and fittings are not exposed.
   1. Coordinate size and location of access doors with Section 083100.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

J. Provide support for utility meters in accordance with requirements of utility companies.

K. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
   1. See Section 099123 for painting of interior plumbing systems and components.

L. Install bell and spigot pipe with bell end upstream.

M. Install valves with stems upright or horizontal, not inverted. See Section 220523.

N. Install water piping to ASME B31.9.

O. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

P. Sleeve pipes passing through partitions, walls, and floors.

Q. Inserts:
   1. Provide inserts for placement in concrete formwork.
   2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
   3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 mm, DN).
   4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
   5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

R. 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 (15 mm) space between finished covering and adjacent work.
   4. Place hangers within 12 inches (300 mm) of each horizontal elbow.
   5. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
   6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
   7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

S. 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 brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.

3.04 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch (10 mm) vertically of location indicated and slope to drain at minimum of 1/4 inch per foot (1:50) slope.

B. Water Piping: Slope at minimum of 1/32 inch per foot (1:400) and arrange to drain at low points.

3.05 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 (345 kPa) above service pressure. Minimum static head of 50 to 150 psi (345 to 1,034 kPa). As an exception, certain codes allow a maximum static pressure of 80 psi (551.6 kPa).

C. Gas Distribution Systems:
   1. Test Preparation: Close each appliance valve or disconnect and cap each connected appliance.
   2. General Systems:
      a. Inject a minimum of 10 psi (68.9 kPa) of compressed air into the piping system for a duration of 15 minutes and verify with a gauge that no perceptible pressure drop is measured.
      b. Ensure test pressure gauge has a range of twice the specific pressure rate selected with an accuracy of 1/10 of 1 pound (0.45 kg).

D. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 330110.58.

B. Prior to starting work, verify system is complete, flushed, and clean.

C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).

D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.

E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

F. Maintain disinfectant in system for 24 hours.

G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.

H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

3.07 SERVICE CONNECTIONS

A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.

B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
   1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.

2. Provide 18 gauge, 0.0478-inch (1.21 mm) galvanized sheet metal sleeve around service main to 6 inch (150 mm) above floor and 6 feet (1800 mm) minimum below grade. Size for minimum of 2 inches (50 mm) of loose batt insulation stuffing.

END OF SECTION

SECTION 221006
PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Backflow preventers.

E. Water hammer arrestors.

F. Fire-rated enclosures.

1.02 RELATED REQUIREMENTS

A. Section 011000 - Summary: Product requirements for Owner furnished kitchen equipment.

1.03 REFERENCE STANDARDS

A. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.

B. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

C. NSF 61 - Drinking Water System Components - Health Effects; 2024.

D. NSF 372 - Drinking Water System Components - Lead Content; 2024.

E. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

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 CLEANOUTS

A. Cleanouts at Exterior Surfaced Areas (CO-1):
   1. Round cast nickel bronze access frame and non-skid cover.

B. Cleanouts at Exterior Unsurfaced Areas (CO-2):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

C. Cleanouts at Interior Finished Floor Areas (CO-3):
   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.

D. Cleanouts at Interior Finished Wall Areas (CO-4):
   1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

E. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.03 HOSE BIBBS

A. Interior Hose Bibbs:
   1. Bronze or brass with mounting flange, replaceable seat, hose thread spout, and integral or add-on vacuum breaker complying with ASSE 1011.
   2. Finishes:
      a. Exposed Locations: Polished chrome.
      b. Mechanical and Equipment Rooms: Polished chrome or rough bronze.
      c. Service Areas: Polished chrome.

2.04 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventer Assembly:
   1. ASSE 1013; cast bronze body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, and non-threaded vent outlet.
   2. Size: 3/4 to 2 inch (20 to 50 mm, DN) assembly with threaded gate valves.
   3. Maximum Working Parameters: 175 psi (1,207 kPa) at 180 degrees F (82.2 degrees C).
   4. Accessories: Provide air gap fitting, lead-free Y-strainer, and test cocks.

2.05 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
   1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.06 FIRE-RATED ENCLOSURES

A. Provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks kitchen sinks.

H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

END OF SECTION

SECTION 224000
PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tank type water closets.

B. Lavatories.

C. Sinks.

D. Under-lavatory pipe supply covers.

1.02 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.

C. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2024.

D. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

E. NSF 61 - Drinking Water System Components - Health Effects; 2024.

F. NSF 372 - Drinking Water System Components - Lead Content; 2024.

G. UL (DIR) - Online Certifications Directory; Current Edition.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on-site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.04 WARRANTY

A. See Section 017800 - 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 drinking water system components certified as complying with NSF 61 and NSF 372.

B. ADA: Where indicated to be ADA-compliant, provide fixtures complying with ADA Standards and ICC A117.1.

2.02 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Comply with UL (DIR) requirements.

C. Perform work in accordance with local health department regulations.

D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.03 TANK TYPE WATER CLOSETS

A. Manufacturers:
   1. American Standard: www.americanstandard-us.com/#sle
   2. Substitutions: See Section 016000 - Product Requirements.

B. Floor-Mounted Bowl:
   1. ASME A112.19.2; siphon jet, vitreous china, 16.5 inches (420 mm) high, 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: 1.28 gal (4.8 L) per flush, maximum.
3. Handle Height: 44 inches (1117 mm) or less.
4. Trapway Outlet: 4 inch (100 mm, DN).

C. Toilet Seats:
1. Plastic: Solid, white, enlongated, open front, hinged seat cover, extended back with self-sustaining hinges, and brass bolts with covers.

2.04 LAVATORIES

A. Under-Mount Basin:
1. Vitreous China: ASME A112.19.2; white interior, oval shape, front overflow, seal of putty, caulking, or concealed vinyl gasket, and white exterior finish. Size as indicated on drawings.

B. Supply Faucet:
1. Deck Mounted Faucet Manufacturers:
2. ASME A112.18.1; chrome plated combination supply fitting with pop-up waste, water economy aerator with maximum flow of 2.2 gpm (8.3 L/min), indexed handles.
3. Single-Lever Handle, Supply Faucet: ASME A112.18.1; deck-mount, ceramic cartridge disc valve, and maximum flow of 1.2 gpm (4.5 L/min).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify walls, floors, and finishes are prepared and ready for installation of fixtures.

B. Verify rough-ins for field connections match sizes and locations shown on drawings.

C. Verify electric power is available and of the correct characteristics.

D. Review casework and countertop shop drawings. Confirm locations and sizes of fixtures and openings before rough-in and installation.

E. Verify casework and countertops are prepared and ready for installation of fixtures.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install components level and plumb.

C. Secure fixtures in place.

D. Install rigid or flexible supplies to fixtures. Provide supply stops, reducers, and escutcheons.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Repair or replace damaged or defective products.

D. Test fixtures after installation to verify operation. Correct deficiencies.

3.04 ADJUSTING

A. Adjust stops and valves so fixtures operate without splashing, noise, or overflow.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean plumbing fixtures to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

END OF SECTION

SECTION 224017
BATHTUBS AND SHOWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Combination tub-showers.

B. Bathtub and shower faucets, valves, and trim.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between fixtures, walls, and floors.

B. Section 102800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.

C. ASME A112.18.2 - Plumbing Waste Fittings; 2020.

D. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers; 2020.

E. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).

F. IAPMO Z124 - Plastic Plumbing Fixtures; 2022, with Editorial Revision.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

H. NSF 61 - Drinking Water System Components - Health Effects; 2024.

I. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's literature and data sheets for each product. Include materials of fabrication, rough-in requirements, location and sizes of connections, configurations, dimensions, finishes, features, and accessories.

C. Operation and Maintenance Data: Provide for the following:
   1. For bathtub and shower faucets, valves, and trim: Provide exploded view and replacement parts list.

D. Specimen warranty.

1.05 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

D. Store products indoors in clean, dry area. Protect from water and dirt. Elevate above floor.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide supply fixtures, fittings, valves, and trim certified as complying with NSF 61 and NSF 372.

B. ADA: Where indicated to be ADA-compliant, provide fixtures complying with ADA Standards and ICC A117.1.

C. Maximum Fixture and Faucet Supply Pressure: 80 psi (550 kPa) unless stated otherwise.

2.02 COMBINATION TUB-SHOWERS

A. Acrylic and Fiberglass Combination Tub-Showers: IAPMO Z124, molded cast acrylic, with slip-resistant bathing surface.

B. Shower Reinforcing: Factory-installed full plywood backing for grab bar placement.

C. Drains and Overflows: Provide ASME A112.18.2, NPS 1-1/2 (DN 40) drain, overflow, and p-trap.
   1. Drain Finish: Brushed nickel.

D. Accessories:
   1. Shower rod.
   2. Shower curtain.

2.03 BATHTUB AND SHOWER FAUCETS, VALVES, AND TRIM

A. Combination Tub-Shower Trim Kits:
   1. Assembly: ASME A112.18.1, with control valve, shower head and arm, tub spout, and diverter.
   2. Control Valve: ASSE 1016, pressure-balancing, brass or bronze body with inlet checkstops; integral volume and temperature control with adjustable high-temperature limit stop.
   3. Finish: Brushed nickel.
   4. Shower Flow Rate: Maximum 2.0 gpm (7.5 L/min) at 80 psi (550 kPa).
   5. Accessory Hand Shower: Provide with ASSE 1014 backflow preventer and hose. Provide diverter valve. Provide hand shower and hose in finish to match shower trim.
      a. Hand Shower Mounting:
         1) Wall bracket.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify walls, floors, and finishes are prepared and ready for installation of fixtures.

B. Verify rough-ins for field connections match sizes and locations shown on drawings.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products level and plumb.

C. Secure fixtures in place.

D. Install ball valves in hot- and cold-water piping to fixtures if supply stops have not been specified or provided. Locate ball valves in accessible locations.

3.03 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean fixtures to remove dirt, fingerprints, paint, and other foreign material. Restore finishes to match original factory finish.

3.04 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

END OF SECTION

SECTION 230513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Applications.

C. Electronically Commutated Motors (ECM).

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators; 2024.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 1/2 horsepower.

D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

E. Operation Data: Include instructions for safe operating procedures.

F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Electrical Service: Refer to Section 260583 for required electrical characteristics.

B. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F (40 degrees C) environment.

3. Design for temperature rise in accordance with NEMA MG 00001 limits for insulation class, service factor, and motor enclosure type.

C. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

D. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
   2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.

B. Motors located in exterior locations, wet air streams downstream of sprayed coil dehumidifiers, draw through cooling towers, air cooled condensers, humidifiers, direct drive axial fans, roll filters, explosion proof environments, and dust collection systems: Totally enclosed type.

C. Motors located in outdoors, in wet air streams downstream of sprayed coil dehumidifiers, in draw through cooling towers, and in humidifiers: Totally enclosed weatherproof epoxy-treated type.

2.03 ELECTRONICALLY COMMUTATED MOTORS (ECM)

A. Applications:
   1. Commercial:
      a. Roof Top Unit:
         1) Operating Mode: Constant speed.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the roof top unit and/or specified sequence of operation.
         3) Shaft Extension: Single.
         4) RPM: 300 through 1200.
      b. Package Terminal Air Conditioner (PTAC):
         1) Operating Mode: Constant speed.
         2) Input: Motor manufacturer to coordinate control requirements with the control board of the PTAC and/or specified sequence of operation.
         3) Shaft Extension: Single.
         4) Options: Resilient mounting.
         5) RPM: 600 through 1800.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 230529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components.

B. Retrofit piping cover system.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

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

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

E. MFMA-4 - Metal Framing Standards Publication; 2004.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
   1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
   1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.

1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

D. Installer Qualifications for Field-Welding: As specified in Section 055000.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
   2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
   3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
   4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Prefabricated Trapeze-Framed Metal Strut Systems:
   1. Strut Channel or Bracket Material:
   2. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Hanger Rods:
   1. Threaded zinc-plated steel unless otherwise indicated.

D. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      a. Comply with MFMA-4.
      b. Channel Material: Use galvanized steel.
      c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

2.02 RETROFIT PIPING COVER SYSTEM

A. General Requirements:
   1. Surface Burning Characteristics: Flame spread index/smoke developed index of 20/250, maximum, when tested in accordance with ASTM E84 or UL 723.

B. Materials:
   1. Piping Cover System: Removal-resistant, modular, snap-fit cover units, clips, and anchors for use with CPVC, steel, and copper piping systems.
   2. Cover Units: L-shaped and U-shaped cross-section units of flame retardant resin material, paintable finish.
   3. Unit Length: 7.5 feet (2.29 m).
   4. Provide coupling fittings for joining units end to end and prefabricated inside and outside corner fittings and end caps as required.
   5. Provide mounting clips to secure covers to wall-ceiling per manufacturer requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

F. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

G. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 230593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

D. Sound measurement of equipment operating conditions.

E. Vibration measurement of equipment operating conditions.

F. ~~Commissioning activities.~~

1.02 RELATED REQUIREMENTS

A. Section 019113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

B. Section 230800 - Commissioning of HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024, with Errata (2025).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect.
   2. Submit to the Commissioning Provider.
   3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   4. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
   5. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Expected problems and solutions, etc.
      f. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
      g. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. 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 Architect 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.

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. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

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. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. 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 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.04 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.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

B. Measure air quantities at air inlets and outlets.

3.07 ~~COMMISSIONING~~

A. ~~See Sections 019113 - General Commissioning Requirements and 230800 for additional requirements.~~

B. ~~Perform prerequisites prior to starting commissioning activities.~~

C. Fill out Prefunctional Checklists for:
   1. Air side systems.
   2. Water side systems.

D. Furnish to the Commissioning Provider, upon request, any data gathered but not shown in the final TAB report.

E. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for 25 percent of the air handlers plus a random sample equivalent to 25 percent of the final TAB report data as directed by Commissioning Provider.
   1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Provider.
   2. Use the same test instruments as used in the original TAB work.
   3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
   4. For purposes of re-check, failure is defined as follows:
      a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
      b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
      c. Temperatures: Deviation of more than one degree F (0.5 degree C).
      d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
      e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
   5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

F. In the presence of the Commissioning Provider, verify that:
   1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
   2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
   3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.08 SCOPE

A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Packaged Terminal Air Conditioning Units.
   3. Unit Air Conditioners.
   4. Air Handling Units.
   5. Fans.

END OF SECTION

SECTION 230713
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 C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.

C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2024.

D. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2025.

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

H. UL 181A - Closure Systems for Use with Rigid Air Ducts; Current Edition, Including All Revisions.

I. UL 181B - Closure Systems for Use with Flexible Air Ducts and Air Connectors; Current Edition, Including All Revisions.

J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

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 documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

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. Insulation: ASTM C553; flexible, noncombustible blanket.
   1. K (Ksi) value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C518.
   2. Maximum Service Temperature: 250 degrees F (121 degrees C).
   3. Maximum Water Vapor Absorption: 5.0 percent by weight.

B. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/(Pa s m)), when tested in accordance with ASTM E96/E96M.
   3. Secure with pressure-sensitive tape.

C. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

D. Indoor Vapor Barrier Mastic:
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter (1.29 mm diameter).

2.03 JACKETING AND ACCESSORIES

A. Aluminum Jacket:
   1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch (0.41 mm) with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
   2. Thickness: 0.016 inch (0.40 mm) sheet.
   3. Finish: Smooth.
   4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
   5. Fittings: 0.016 inch (0.40 mm) thick die-shaped fitting covers with factory-attached protective liner.
   6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

B. UL181 Tape for Rigid and Flexible Ductwork:
   1. Comply with UL 181A for rigid ductwork.
   2. Comply with UL 181B for flexible ductwork.
   3. Aluminum foil coated with pressure-sensitive adhesive on paper release liner.
   4. Foil tape suitable for sealing seams between insulation, insulated elbows, and fittings resulting in a tight, smooth surface without wrinkles.

2.04 DUCT LINER

A. 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 (0.045 at 24 degrees C).
   3. Service Temperature: Up to 250 degrees F (121 degrees C).
   4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm (25.4 m/s), minimum.
   5. Minimum Noise Reduction Coefficients:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with NAIMA National Insulation Standards.

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. Slope exterior ductwork to shed water.

E. External Duct Insulation Application:

F. Duct Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Seal and smooth joints. Seal and coat transverse joints.
   3. Seal liner surface penetrations with adhesive.

END OF SECTION

SECTION 230800
COMMISSIONING OF HVAC

~~PART 1 GENERAL~~

1.01 ~~SUMMARY~~

A. See Section 019113 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 019113.

B. This section covers the Contractor's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Provider (CxP) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor's use.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:
   1. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - Application of the Commissioning Process to New HVAC&R Systems; 2025.

1.03 SUBMITTALS

A. Updated Submittals: Keep Commisioning Provider (CxP) informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Provider.

C. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:
   1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
   2. Full as-built set of control drawings.
   3. Full as-built sequence of operations for each piece of equipment.
   4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
      a. Floor.
      b. Room number.
      c. Room name.
      d. Air handler unit ID.
      e. Reference drawing number.
      f. Air terminal unit tag ID.
      g. Heating and/or cooling valve tag ID.
      h. Minimum air flow rate.
      i. Maximum air flow rate.
   5. Full print out of all schedules and set points after testing and acceptance of the system.
   6. Full as-built print out of software program.
   7. Electronic copy on disk of the entire program for this facility.

8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.
    d. Controller and/or module data.
    e. Thermostats and timers.
    f. Sensors and DP switches.
    g. Valves and valve actuators.
    h. Dampers and damper actuators.
    i. Program setups (software program printouts).

D. Project Record Documents: See Section 017800 for additional requirements.
1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.
2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

E. Draft Training Plan: In addition to requirements specified in Section 017900, include:
1. Follow the recommendations of ASHRAE Guideline 1.1.
2. Control system manufacturer's recommended training.
3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

F. Training Manuals: See Section 017900 for additional requirements.
1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

~~PART 2 PRODUCTS~~

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.

~~PART 3 EXECUTION~~

3.01 PREPARATION

A. Cooperate with CxP in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by CxP.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by CxP; update the schedule as appropriate.

D. Notify CxP when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction, notify ahead of time and be proactive in seeing that CxP has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 INSPECTING AND TESTING - GENERAL

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by CxP for each item of equipment or other assembly to be commissioned.

C. Provide two-way radios for use during the testing.

D. Valve/Damper Stroke Setup and Check:
   1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
   2. Set pump/fan to normal operating mode.
   3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
   4. Command valve/damper open; verify position is full open and adjust output signal as required.
   5. Command valve/damper to a few intermediate positions.
   6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

E. Isolation Valve or System Valve Leak Check: For valves not by coils.
   1. With full pressure in the system, command valve closed.
   2. Use an ultra-sonic flow meter to detect flow or leakage.

F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

3.03 TAB COORDINATION

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup, and component Functional Tests of the system completed and approved by CxP prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 CONTROL SYSTEM FUNCTIONAL TESTING

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the

requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by CxP.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.
   1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner.
   2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to CxP during testing of controlled equipment; coordinate with commissioning of equipment.
   1. Setpoint changing features and functions.
   2. Sensor calibrations.

G. Demonstrate to CxP:
   1. That all specified functions and features are set up, debugged and fully operable.
   2. That scheduling features are fully functional and setup, including holidays.
   3. That all graphic screens and value readouts are completed.
   4. Correct date and time setting in central computer.
   5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner.
   6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner.
   7. Power failure and battery backup and power-up restart functions.
   8. Global commands features.
   9. Security and access codes.
   10. Occupant over-rides (manual, telephone, key, keypad, etc.).
   11. O&M schedules and alarms.
   12. Occupancy sensors and controls.
   13. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested, correct all systems, equipment, components, and software required at no additional cost to Owner.

3.05 OPERATION AND MAINTENANCE MANUALS

A. See Section 017800 for additional requirements.

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

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

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

3.06 DEMONSTRATION AND TRAINING

A. See Section 017900 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to CxP during Functional Testing.

D. Provide classroom and hands-on training of Owner's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:

E. TAB Review: Instruct Owner's personnel for minimum 4 hours, after completion of TAB, on the following:
   1. Review final TAB report, explaining the layout and meanings of each data type.
   2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
   3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
   4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
   5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:
   1. Phase 1 - Basic Control System: Provide minimum of 8 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
      a. This training may be held on-site or at the manufacturer's facility.
      b. If held off-site, the training may occur prior to final completion of the system installation.
      c. For off-site training, Contractor shall pay expenses of up to two attendees.
   2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 16 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:
      a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.
      b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.
      c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.
      d. Every display screen, allowing time for questions.
      e. Point database entry and modifications.
   3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of 4 hours of training. Tailor training session to questions and topics solicited beforehand from Owner. Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

SECTION 232300
REFRIGERANT PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping.
B. Refrigerant.
C. Moisture and liquid indicators.
D. Valves.
E. Strainers.
F. Check valves.
G. Pressure regulators.
H. Pressure relief valves.
I. Filter-driers.
J. Solenoid valves.
K. Expansion valves.
L. Receivers.
M. Flexible connections.

1.02 REFERENCE STANDARDS

A. AHRI 495 - Performance Rating of Refrigerant Liquid Receivers; 2005.
B. AHRI 710 (I-P) - Performance Rating of Liquid-Line Driers; 2009.
C. AHRI 711 (SI) - Performance Rating of Liquid-Line Driers; 2009.
D. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.
E. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Addendum (2025).
F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
G. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.
H. ASME B31.9 - Building Services Piping; 2025.
I. 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; 2025, with Errata.
J. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .
K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.
L. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
M. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.
N. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Filter-Driers:
   1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.

2.02 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

C. Welders Certification: In accordance with ASME BPVC-IX.

D. Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

2.03 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn or O60 soft annealed.
   1. Fittings: ASME B16.22 wrought copper.
   2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.
   3. Push-to-Connect Fittings: Complying with UL 207.

2.04 REFRIGERANT

A. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

2.05 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F (93 degrees C) and maximum working pressure of 500 psi (3450 kPa).

2.06 VALVES

2.07 STRAINERS

2.08 CHECK VALVES

A. Globe Type:
   1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F (149 degrees C) and maximum working pressure of 425 psi (2930 kPa).

2.09 PRESSURE REGULATORS

A. Brass body, stainless steel diaphragm, direct acting, adjustable over 0 to 80 psi (0 to 550 kPa) range, for maximum working pressure of 450 psi (3100 kPa).

2.10 PRESSURE RELIEF VALVES

A. Straight Through or Angle Type: Brass body and disc, neoprene seat, factory sealed and stamped with ASME UV and National Board Certification NB, selected to ASHRAE Std 15, with standard setting of 235 psi (1620 kPa).

2.11 FILTER-DRIERS

A. Performance:
   1. Flow Capacity - Liquid Line: ____ ton (____ kW), minimum, rated in accordance with AHRI 710 (I-P) (AHRI 711 (SI)).
   2. Pressure Drop: 2 psi (14 kPa), maximum, when operating at full connected evaporator capacity.
   3. Design Working Pressure: 350 psi (2410 kPa), minimum.

B. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

C. Construction: UL listed.
   1. Connections: As specified for applicable pipe type.

2.12 SOLENOID VALVES

A. Coil Assembly: UL 429 UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.13 EXPANSION VALVES

A. Angle or Straight Through Type: AHRI 760 (I-P); design suitable for refrigerant, brass body, internal or external equalizer, bleed hole, adjustable superheat setting, replaceable inlet strainer, with nonreplaceable capillary tube and remote sensing bulb and remote bulb well.

B. Selection: Evaluate refrigerant pressure drop through system to determine available pressure drop across valve. Select valve for maximum load at design operating pressure and minimum 10 degrees F (6 degrees C) superheat. Select to avoid being undersized at full load and excessively oversized at part load.

2.14 ELECTRONIC EXPANSION VALVES

A. Valve:

B. Evaporation Control System:
   1. Electronic microprocessor based unit in enclosed case, proportional integral control with adaptive superheat, maximum operating pressure function, preselection allowance for electrical defrost and hot gas bypass.

C. Refrigeration System Control: Electronic microprocessor based unit in enclosed case, with proportional integral control of valve, on/off thermostat, air temperature alarm (high and low), solenoid valve control, liquid injection adaptive superheat control, maximum operating pressure function, night setback thermostat, timer for defrost control.

2.15 RECEIVERS

A. Internal Diameter 6 inch (150 mm) and Smaller:
   1. AHRI 495, UL listed, steel, brazed; 400 psi (2760 kPa) maximum pressure rating, with tappings for inlet, outlet, and pressure relief valve.

B. Internal Diameter Over 6 inch (150 mm):
   1. AHRI 495, welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; 400 psi (2760 kPa) with tappings for liquid inlet and outlet valves, pressure relief valve, and magnetic liquid level indicator.

2.16 FLEXIBLE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches (230 mm) long with copper tube ends; for maximum working pressure of 500 psi (3450 kPa).

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 refrigeration specialties in accordance with manufacturer's instructions.

B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

C. Install piping to conserve building space and avoid interference with use of space.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

END OF SECTION

SECTION 233100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ducts.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 230130.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.

C. Section 233319 - 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; 2025a.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026.

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

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. Fibrous glass duct can be substituted at the Contractor's option.

C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.

D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
   1. Round: Plus or minus 2 in-wc (500 Pa) of galvanized steel.
   2. Rectangular: Plus or minus 1/2 in-wc (125 Pa) 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 (125 Pa) pressure class, galvanized steel.
      b. Outside Air Intake: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
      c. Return and Relief Air: 1/2 in-wc (125 Pa) pressure class, galvanized steel.
      d. General Exhaust Air: 1/2 in-wc (125 Pa) 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. Rectangular Metal Duct:
   1. Rectangular Single Wall: Rectangular, longitudinal lock seam duct with galvanized steel 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. VOC Content: Not more than 250 g/L, excluding water.
      c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   4. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
   5. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:
      a. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
      b. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
      c. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

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. Comply with safety standards NFPA 90A and NFPA 90B.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

H. Connect terminal units to supply ducts directly or with one foot (300 mm) maximum length of flexible duct. Do not use flexible duct to change direction.

I. Fire Partitions: Provide firestopping sealing. See Section 078400.

3.02 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. ~~Clean thoroughly each duct system. See Section 230130.51.~~

END OF SECTION

SECTION 233423
HVAC POWER VENTILATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof exhausters.

B. Fire-rated enclosures.

1.02 REFERENCE STANDARDS

A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

B. AMCA 99 - Standards Handbook; 2025.

C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2020.

D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

E. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

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.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

C. Sequencing: Ensure that utility connections are completed in an orderly and expeditious manner.

1.04 SUBMITTALS

A. See Section 013000 - 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. Manufacturer's Instructions: Indicate installation instructions.

D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

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 ROOF EXHAUSTERS

A. Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch (13 mm) mesh, 0.62 inch (1.6 mm) thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.

B. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.

C. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm gets attained 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. Secure roof exhausters with cadmium plated steel lag screws to roof curb.

C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

D. Provide sheaves required for final air balance.

E. Install backdraft dampers on inlet to roof and wall exhausters.

F. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 237313
MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Casing construction.

B. Fan section.

C. Coil section.

D. Filter and air cleaner section.

E. Damper section.

1.02 RELATED REQUIREMENTS

A. Section 233413 - Axial HVAC Fans.

1.03 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015, with Errata (2026).

B. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils; 2001, with Addenda (2011).

C. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

D. AMCA 99 - Standards Handbook; 2025.

E. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

F. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

H. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

I. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

J. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. 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.

L. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011 (Reapproved 2021).

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

O. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

P. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Published Literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.
2. Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
3. Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
4. Sound Power Level Data: Fan outlet and casing radiation at rated capacity.

5. Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

C. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

D. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

E. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

F. Manufacturer's Instructions: Include installation instructions.

G. Maintenance Data: Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements for additional provisions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.02 CASING CONSTRUCTION

A. Full Perimeter Base Rail:
1. Construct of galvanized steel.
2. Provide base rail of sufficient height to raise unit for external trapping of condensate drain pans.

B. Casing:
1. Construct of one piece, insulated, double wall panels.
2. Provide mid-span, no through metal, internal thermal break.
3. Construct outer panels of galvanized steel and inner panels of galvanized steel.
4. Casing Air Pressure Performance Requirements:
   a. Able to withstand up to 8 in-wc (2 kPa) positive or negative static pressure.
   b. Not to exceed 0.0042 inches per inch (0.000165 mm per mm) deflection at 1.5 times design static pressure up to a maximum of plus 8 in-wc (2 kPa) in positive pressure sections and minus 8 in-wc (2 kPa) in negative pressure sections.

C. Access Doors:
1. Construction, thermal and air pressure performance same as casing.
2. Provide surface mounted handles on hinged, swing doors.

D. Outside Air and Exhaust Air Weather Hood:
   1. Fabricate from same material as casing outer panel.
   2. Extend hood past perimeter of unit casing opening so as not to instruct airflow path.
   3. Paint hoods with same finish as external surface of outdoor units.
   4. Provide inlet hood for each fresh air damper with a sine wave moisture eliminator to prevent entrainment of water into the unit from outside air.
   5. Provide exhaust hoods for each exhaust air opening.
   6. Size each hood for 100 percent of nominal fresh air damper capacities.
   7. Protect each hood with bird screen to prevent nesting at intake or exhaust airflow paths.

E. Unit Flooring: Construct with sufficient strength to support expected people and equipment loads associated with maintenance activities.

F. Casing Leakage: Seal joints and provide airtight access doors so that air leakage does not exceed one percent of design flow at the specified casing pressure.

G. Insulation:
   1. Provide minimum thermal thickness of 12 R (2.29 RSI) throughout.
   2. Completely fill panel cavities in each direction to prevent voids and settling.
   3. Comply with NFPA 90A.

H. Drain Pan Construction:
   1. Provide cooling coil and humidifier sections with an insulated, double wall, stainless steel drain pan complying with ASHRAE Std 62.1 for indoor air quality and sufficiently sized to collect all condensate.
   2. Slope in two planes to promote positive drainage and eliminate stagnate water conditions.
   3. Locate outlet of sufficient diameter at lowest point of pan to prevent overflow at normal operating conditions.
   4. Provide threaded drain connections constructed of drain pan material, extended sufficient distance beyond the base to accommodate field installed, condensate drain trapping.
   5. Provide drain pan float switch

I. Louvers: Stationary, of galvanized steel, 4 inches (100 mm) deep with plenum, nylon bearings, 1/2-inch (13 mm) mesh, 0.04-inch (1.0 mm) galvanized wire bird screen in aluminum frame, and bearing AMCA Certified Ratings Seal in accordance with AMCA 500-L. Furnish adjustable louvers with hollow vinyl bulb edging on blades and foam side stops to limit leakage to maximum 2 percent at 4 in-wc (1 kPa) differential pressure when sized for 2000 fpm (10 m/s) face velocity.

J. Finish:
   1. Outdoor Units:
      a. Coat external surface of unit casing with primer and minimum 1.5 mil, enamel paint finish.
      b. Comply with salt spray test in accordance with ASTM B177/B177M.
      c. Color: Manufacturer's standard color.
   2. Indoor Units:
      a. Provide exterior, galvanized steel panels with painted surface complying with ASTM B177/B177M.
      b. Color: Manufacturer's standard color.

2.03 FAN SECTION

A. Type: Forward curved, single width, single inlet, centrifugal plug fan, in accordance with AMCA 99. See Section 233413

B. Performance Ratings: Determined in accordance with AMCA 210 and labeled with AMCA Certified Rating Seal.

C. Sound Ratings: AMCA 301; tested to AMCA 300 and label with AMCA Certified Sound Rating Seal.

D. Bearings: Self-aligning, grease lubricated, with lubrication fittings extended to exterior of casing with plastic tube and grease fitting rigidly attached to casing.

E. External Motor Junction Box: Factory mount NEMA 4 external junction box and connect to extended motor leads from internally mounted motors.

F. Motor Wiring Conduit: Factory wire fan motor wiring to the unit mounted starter-disconnect, variable frequency drive, and external motor junction box.

G. Fan Accessories:

H. Flexible Duct Connections:
   1. For separating fan, coil, and adjacent sections.

I. Drives:
   1. Comply with AMCA 99.
   2. Bearings: Heavy duty pillow block type, ball bearings, with ABMA STD 9 L-10 life at 50,000 hours.
   3. Shafts: Solid, hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil.
   4. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts, and keyed. Variable and adjustable pitch sheaves for motors 15 hp (11.2 kW) and under selected so required rpm is obtained with sheaves set at mid-position; fixed sheave for 20 hp (15 kW) and over, matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
   5. Belt Guard: Fabricate to SMACNA (DCS); 0.106 inch (2.6 mm) thick, 3/4 inch (20 mm) diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.04 COIL SECTION

A. Casing: Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.

B. Drain Pans: 24 inch (600 mm) downstream of coil and down spouts for cooling coil banks more than one coil high.

C. Eliminators: Three break of galvanized steel, mounted over drain pan.

D. Air Coils:
   1. Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.

E. Fabrication:
   1. Tubes: 5/8 inch (16 mm) OD seamless copper expanded into fins, brazed joints.
   2. Fins: Aluminum.
   3. Casing: Die formed channel frame of galvanized steel.

2.05 FILTER AND AIR CLEANER SECTION

A. General: Provide filter sections with filter racks, minimum of one access door for filter removal, and filter block-offs to prevent air bypass.

B. Differential Pressure Gauge:
   1. Provide factory installed dial type differential pressure gauge, flush mounted with casing outer wall, and fully piped to both sides of each filter to indicate status.
   2. Maintain plus/minus 5 percent accuracy within operating limits of 20 degrees F (minus 6.7 degrees C) to 120 degrees F (48.9 degrees C).

2.06 DAMPER SECTION

A. Mixing Section: Provide a functional section to support the damper assembly for modulating the volume of outdoor, return, and exhaust air.

B. Damper Blades:
   1. Double-skin airfoil design with metal, compressible jamb seals and extruded-vinyl blade-edge seals on each blade.
   2. Self-lubricating stainless steel or synthetic sleeve bearings.
   3. Comply with ASHRAE Std 90.1 I-P for rated maximum leakage rate.
   4. Provide leakage testing and pressure ratings in compliance with AMCA 500-D test methods.
   5. Arrange in parallel or opposed-blade configuration.

C. Barometric Relief Dampers:
   1. Frame: Roll formed galvanized steel.
   2. Blades: Roll formed galvanized steel.
   3. Blade Seals: Extruded vinyl, mechanically attached to the blade edge.
   4. Material:

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Bolt sections together with gaskets.

C. Provide fixed sheaves required for final air balance.

D. Make connections to coils with unions or flanges.

3.02 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform systems startup.

B. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.

C. Adjust for proper operation within manufacturer's published tolerances.

D. UV-C system to be commissioned by manufacturer field representative.

3.03 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for closeout submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
   3. Briefly describe function, operation, and maintenance of each component.

E. 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 of training.

END OF SECTION

SECTION 238113
PACKAGED TERMINAL AIR-CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air conditioning units.

B. Cabinet.

C. Evaporator fan.

D. Compressor.

E. Evaporator coil.

F. Condenser.

G. Heating coil.

H. Air filters.

I. Controls.

1.02 RELATED REQUIREMENTS

A. Section 232300 - Refrigerant Piping.

1.03 REFERENCE STANDARDS

A. NEMA MG 00001 - Motors and Generators; 2024.

B. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for manufactured products and assemblies. Indicate water, drain, thermostatic valves, and electrical rough-in connections with electrical characteristics and connection requirements.

C. Manufacturer's Instructions: Indicate assembly, support details, connection requirements, and include start-up instructions.

D. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

2.01 AIR CONDITIONING UNITS

A. Description: Packaged, self-contained, factory assembled, prewired unit, consisting of cabinet, compressor, condensing coil, evaporator fan, evaporator coil, discharge plenum, outside air connection, heating coil, air filters, and controls; fully charged with refrigerant and filled with oil.

B. Assembly: Up flow air delivery, in draw-through configuration as indicated.

C. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

D. Energy Efficiency:

2.02 CABINET

A. Frame and Panels: Galvanized steel with baked enamel finish, easily removed access doors or panels with quick fasteners.

B. Insulation: Minimum 1/2 inch (13 mm) thick acoustic duct liner for lining cabinet interior.

C. Drain Pan: Galvanized steel with corrosion-resistant coating.

2.03 EVAPORATOR FAN

2.04 COMPRESSOR

A. Hermetically sealed, 3600 rpm maximum, resiliently mounted with positive lubrication and internal motor protection.

2.05 EVAPORATOR COIL

A. Direct expansion coiling coil of seamless copper or aluminum tubes expanded into aluminum fins.

B. Refrigeration circuit with externally equalized thermal expansion valve, filter-drier, and charging valves.

2.06 CONDENSER

A. Co-Axial: Copper tube in copper tube or shell and tube with finned copper tubes in steel shell with water temperature actuated water regulating valve.

B. Fan: Double width, double inlet, forward curved centrifugal fan, statically and dynamically balanced, with permanently lubricated bearings.

C. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.

2.07 HEATING COIL

A. Helical nickel-chrome resistance wire coil heating elements with refractory ceramic support bushings, with automatic reset thermal cut-out, built-in magnetic contactors, manual reset thermal cut-out, airflow proving device, load fuses.

2.08 AIR FILTERS

A. Easily removed one inch (25 mm) thick permanent cleanable panel filters.

2.09 CONTROLS

A. Factory wired controls shall include contactor, high and low pressure cutouts, internal winding thermostat for compressor, control circuit transformer, non-cycling reset relay.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with requirements of NFPA 90A.

C. Provide shut-off valves in condenser water inlet and outlet piping.

D. Pipe refrigerant from unit to condenser; see section 232300.

E. Pipe condensate from drain pan to condensate drainage system.

END OF SECTION

SECTION 238119
SELF-CONTAINED AIR-CONDITIONERS

<<<< UPDATE NOTES

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Packaged terminal air conditioning units.

B. Packaged terminal heat pump units.

C. Wall sleeves.

D. Louvers.

E. Controls.

2.02 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 270 (SI/I-P) - Sound Performance Rating of Outdoor Unitary Equipment; 2025.

2.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide drawings indicating dimensions, rough-in connections, and electrical characteristics and connection requirements.

C. Samples: Submit one sample of wall louver.

D. Manufacturer's Instructions: Include assembly instructions, support details, connection requirements, and start-up instructions.

E. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

F. Operation and Maintenance Data: Provide maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

2.04 DELIVERY, STORAGE, AND HANDLING

A. Protect finished cabinets from physical damage by leaving factory packing cases in place before installation and providing temporary covers after installation.

2.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide a five year warranty to include coverage for refrigeration compressors.

PART 2 PRODUCTS

3.01 PERFORMANCE REQUIREMENTS

A. Scheduled Performance:
   1. Cooling Capacity: AHRI 210/240.
   2. Reverse Cycle Heating Capacity: AHRI 210/240.
   3. Unit Sound Number: AHRI 270 (SI/I-P).

3.02 AIR CONDITIONING UNITS

A. Description: Packaged, self-contained, through-the-wall air cooled terminal air conditioning units, with wall sleeve, room cabinet, electric refrigeration system, electric heating, outside air louvers, built-in temperature controls; fully charged with refrigerant and filled with oil.

B. Refrigerant: Use only refrigerants that have ozone depletion potential (ODP) of zero and global warming potential (GWP) no greater than that allowed by federal code.

C. Electrical Characteristics:
   1. Refer to PTAC schedule for electrical requirements.

D. Energy Efficiency:
   1. Cooling Capacity: 7000 Btu/h (2052 W) through 1500 Btu/h (4396 W):
      a. Energy Efficiency Ratio: 10.0.
      b. Seasonal Coefficient of Performance: 3.19, minimum.

3.03 CABINET

A. Cabinet: Wall mounted of 18 gauge, 0.0478 inch (1.21 mm) galvanized steel with epoxy coated finish, removable front panel with concealed latches, color as selected.

B. Discharge Grille and Access Door: Removablepunched louver discharge grilles, allowing 4-way discharge air pattern with hinged door in top of cabinet for access to controls.

3.04 WALL SLEEVES AND LOUVERS

A. Wall Sleeves: size per drawings, 16 gauge, 0.0598 inch (1.52 mm) galvanized steel with protective mastic coating.

B. Louvers: Provide flush anodized aluminum with enamel finish, color as selected.

3.05 CHASSIS

A. Refrigeration System:
   1. Direct expansion cooling coil.
   2. Hermetically sealed compressor with internal spring isolation, external isolation, permanent split capacitor motor and overload protection.
   3. Accumulator.

B. Air System: Centrifugal forward curved tangential evaporator fans with two speed permanent split capacitor motor, permanent washable filters, positive pressure ventilation damper with concealed manual operator.

C. Condensate Drain: Drain pan to direct condensate to condenser coil for re-evaporation.

3.06 CONTROLS

A. Control Module: Unit mounted adjustable thermostat with heat anticipator, heat-off-cool switch, high-low fan switch.

PART 3 EXECUTION

4.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate installation of units with architectural, mechanical, and electrical work.

C. On water coils, provide shut-off valve on supply line and balancing valve on return line. Provide manual air vents at high points complete with stop valve.

D. In steam coils, provide shut-off valve and vacuum breaker in steam line. Install steam traps with outlet below coil return connection.

4.02 SCHEDULES

END OF SECTION

SECTION 238126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air-source heat pumps.

B. Air cooled condensing units.

C. Indoor air handling (fan and coil) units for ducted systems.

D. Humidifiers.

E. Controls.

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections and installation and wiring of thermostats and other controls components.

1.03 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. AHRI 610 (I-P) - Performance Rating of Central System Humidifiers for Residential Applications; 2014.

D. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.

E. NEMA MG 00001 - Motors and Generators; 2024.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.

F. Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

H. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

I. Project Record Documents: Record actual locations of components and connections.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide three year manufacturers warranty for solid state ignition modules.

C. Provide five year manufacturers warranty for heat exchangers.

D. Provide five year manufacturers warranty for electronic air cleaners.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
   1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator; auxiliary electric heat.
   2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

C. Electrical Characteristics:
   1. All electric characteristics per drawings.

   2. Disconnect Switch: Factory mount disconnect switch on equipment under provisions of Section 260583.

2.02 INDOOR AIR HANDLING UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
   1. Air Flow Configuration: Upflow.
   2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
   1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
   2. Motor Electrical Characteristics:

C. Air Filters: 1 inch (25 mm) thick urethane, washable type arranged for easy replacement.

D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
   1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.
   2. Manufacturers: System manufacturer.

2.03 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
   1. Refrigerant: R-454B.
   2. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL 207.

B. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

C. Accessories: Filter drier, high-pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).

1. Provide thermostatic expansion valves.

D. Operating Controls:
   1. Control by room thermostat to maintain room temperature setting.

2.04 ACCESSORY EQUIPMENT

A. Humidifiers: Comply with AHRI 610 (I-P) or AHRI 611 (SI) Wetted plate, pan type with float controlled water supply, thermoplastic water pan for mounting on furnace return air plenum.
   1. Duct Connection: 6 inches (150 mm) diameter flexible duct, starting collar and damper.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and in correct location.

C. Verify that proper fuel supply is available for connection.

D. Verify that water supply is available for humidifier.

3.02 INSTALLATION

A. Install in accordance with NFPA 90A and NFPA 90B.

B. Install humidifiers in accordance with AHRI 610 (I-P) or AHRI 611 (SI).

C. Pipe drain from humidifiers to nearest floor drain.

END OF SECTION

SECTION 260505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies to Architect before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner before partially or completely disabling system.
   2. Notify local fire service.
   3. Make notifications at least 24 hours in advance.
   4. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

E. Disconnect and remove abandoned panelboards and distribution equipment.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

A. See Section 017419 - Construction Waste Management and Disposal for additional requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Armored cable.

C. Metal-clad cable.

D. Wiring connectors.

E. Electrical tape.

F. Wire pulling lubricant.

G. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

H. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

K. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

D. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.

E. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.

F. Field Quality Control Test Reports.

G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:

1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

H. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. Color Code:
a. 208Y/120 V, 3 Phase, 4 Wire System:
1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral/Grounded: White.
b. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

2.05 ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).

B. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
      a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
      b. Increase size of conductors as required to account for ampacity derating.
      c. Size raceways, boxes, etc. to accommodate conductors.
      d. _____.
   8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
      a. Branch circuits fed from ground fault circuit interrupter (GFCI) circuit breakers.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

J. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

L. Insulate ends of spare conductors using vinyl insulating electrical tape.

M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
   1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. For signal reference grids, coordinate the work with access flooring furnished in accordance with Section 096900.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Shop Drawings:
   1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.

B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 260583
WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

2.02 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 260923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Occupancy sensors.

B. Emergency lighting control devices.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
   1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:
   1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
   2. Digital Load Controllers: Provide dimensioned plan views indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing factory and field connections. Include manufacturer product characteristics and application instructions for wired and wireless applications, including start-up and commissioning.
   3. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.

D. Field quality control reports.

1.05 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Maintain at project site one copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for duration below. Complete forms in Owner's name and register with manufacturer.
   1. Occupancy Sensors: 5 years.

2. Utility Grade Locking Receptacle-Mounted Outdoor Photo Controls: 5 years.
3. Digital Load Controllers: 5 years.
4. Emergency Lighting Control Devices: 5 years.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for purpose intended.

B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.

2.02 OCCUPANCY SENSORS

A. General Requirements:
1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
8. Sensitivity: Field adjustable.
9. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

B. Ceiling Mounted Occupancy Sensors:
1. General Requirements:
   a. Description: Low profile occupancy sensors designed for ceiling installation.
   b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
   c. Provide field selectable setting for disabling LED motion detector visual indicator.
   d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
   e. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet (41.8 square meters) at mounting height of 9 feet (2.7 m), with field of view of 360 degrees.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.

G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 260533.16.

C. Maintain separation of remote-control, signaling, and power-limited circuits.
   1. See manufacturer instructions and Section 260519 for control wiring conductors, wiring methods, and identification requirements.

D. Install lighting control devices in accordance with manufacturer's instructions.

E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

F. Install lighting control devices plumb and level, and held securely in place.

G. Where required and not furnished with lighting control device, provide wall plate; see Section 262726.

H. Provide required supports; see Section 260529.

I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.

D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

END OF SECTION

SECTION 262413
SWITCHBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Low-voltage (600 V and less) switchboards and associated accessories for service and distribution applications.

B. Overcurrent protective devices for switchboards.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCE STANDARDS

A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.

F. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 891 - Switchboards; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Coordinate with manufacturer to provide shipping splits suitable for the dimensional constraints of the installation.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Service Entrance Switchboards:
   1. Coordinate with Utility Company to provide switchboards with suitable provisions for electrical service and utility metering, where applicable.
   2. Coordinate with Owner to arrange for Utility Company required access to equipment for installation and maintenance.
   3. Obtain Utility Company approval of switchboard prior to fabrication.
   4. Preinstallation Meeting: Convene one week prior to commencing work of this section to review requirements with Utility Company representative.
   5. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for switchboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate dimensions, voltage, bus ampacities, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of switchboards and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.
   3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   4. Include documentation of listed series ratings upon request.
   5. Include documentation demonstrating selective coordination upon request.
   6. Identify mounting conditions required for equipment seismic qualification.

D. Service Entrance Switchboards: Include documentation of Utility Company approval of switchboard.

E. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 2 as production (routine) tests.

F. Field Quality Control Test Reports.

G. Project Record Documents: Record actual installed locations of switchboards and final equipment settings.

H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store switchboards in accordance with manufacturer's instructions, NECA 400, and NEMA PB 2.1.

B. Store in a clean, dry space having a uniform temperature to prevent condensation (including outdoor switchboards, which are not weatherproof until completely and properly installed). Where necessary, provide temporary enclosure space heaters or temporary power for permanent factory-installed space heaters.

C. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 SWITCHBOARDS

A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.

D. Front-Connected Switchboards:
   1. Main Device(s): Individually-mounted.
   2. Feeder Devices: Panel/group-mounted.

E. Service Conditions:
   1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
      a. Altitude: Less than 6,600 feet (2,000 m).
      b. Ambient Temperature:
         1) Switchboards Containing Molded Case or Insulated Case Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
   2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

F. Short Circuit Current Rating:

G. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.

H. Bussing: Sized in accordance with UL 891 temperature rise requirements.
   1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
   2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
   3. Phase and Neutral Bus Material: Aluminum.
   4. Ground Bus Material: Aluminum.

I. Conductor Terminations: Suitable for use with the conductors to be installed.
   1. Line Conductor Terminations:
      a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
      b. Main and Neutral Lug Type: Mechanical.
   2. Load Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
      b. Lug Type:

J. Enclosures:
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   2. Finish: Manufacturer's standard unless otherwise indicated.

K. Future Provisions:
   1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

L. Owner Metering:
   1. Provide microprocessor-based digital electrical metering system including all instrument transformers, wiring, and connections necessary for measurements specified.
   2. Measured Parameters:
      a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
      b. Current (Amps): For each phase and neutral.
      c. Frequency (Hz).
      d. Real power (kW): For each phase, 3-phase total.
      e. Reactive power (kVAR): For each phase, 3-phase total.
      f. Apparent power (kVA): For each phase, 3-phase total.
      g. Power factor.
   3. Meter Accuracy: Plus/minus 1.0 percent.

M. Instrument Transformers:

1. Comply with IEEE C57.13.
2. Select suitable ratio, burden, and accuracy as required for connected devices.
3. Current Transformers: Connect secondaries to shorting terminal blocks.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

2.02 OVERCURRENT PROTECTIVE DEVICES

A. Circuit Breakers:
   1. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
      c. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.

2.03 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test switchboards according to NEMA PB 2, including the following production (routine) tests on each switchboard assembly or component:
   1. Dielectric tests.
   2. Mechanical operation tests.
   3. Grounding of instrument transformer cases test.
   4. Electrical operation and control wiring tests, including polarity and sequence tests.
   5. Ground-fault sensing equipment test.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the switchboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive switchboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install switchboards in accordance with NECA 1 (general workmanship), NECA 400, and NEMA PB 2.1.

C. Arrange equipment to provide required clearances and maintenance access, including accommodations for any drawout devices.

D. Where switchboard is indicated to be mounted with inaccessible side against wall, provide minimum clearance of 1/2 inch (10 mm) between switchboard and wall.

E. Provide required support and attachment in accordance with Section 260529.

F. Provide required seismic controls in accordance with Section 260548.

G. Install switchboards plumb and level.

H. Unless otherwise indicated, mount switchboards on properly sized 4 inch (100 mm) high concrete pad constructed in accordance with Section 033000.

I. Provide grounding and bonding in accordance with Section 260526.

J. Install all field-installed devices, components, and accessories.

K. Provide fuses complying with Section 262813 for fusible switches as indicated.

L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

M. Set field-adjustable circuit breaker tripping function settings as indicated.

N. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed in accordance with Section 260573.

O. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

P. Provide filler plates to cover unused spaces in switchboards.

Q. Identify switchboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide services of a manufacturer's authorized representative to observe installation and assist in inspection and testing. Include manufacturer's reports with submittals.

C. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

D. Before energizing switchboard, perform insulation resistance testing in accordance with NECA 400 and NEMA PB 2.1.

E. Inspect and test in accordance with NETA ATS, except Section 4.

F. Perform inspections and tests listed in NETA ATS, Section 7.1.

G. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

H. Molded Case and Insulated Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

I. Meters: Perform inspections and tests listed in NETA ATS, Section 7.11.2.

J. Instrument Transformers: Perform inspections and tests listed in NETA ATS, Section 7.10. The dielectric withstand tests on primary windings with secondary windings connected to ground listed as optional are not required.

K. Correct deficiencies and replace damaged or defective switchboards or associated components.

3.04 CLEANING

A. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

B. Clean dirt and debris from switchboard enclosures and components according to manufacturer's instructions.

C. Repair scratched or marred surfaces to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. See Section 017900 - Demonstration and Training, for additional requirements.

C. Training: Train Owner's personnel on operation, adjustment, and maintenance of switchboard and associated devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Manufacturer's authorized representative.
4. Location: At project site.

3.06 PROTECTION

A. Protect installed switchboards from subsequent construction operations.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Load centers.

D. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2025.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

G. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 67 - Panelboards; Current Edition, Including All Revisions.

K. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

L. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.
   3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   4. Include documentation of listed series ratings upon request.
   5. Identify mounting conditions required for equipment seismic qualification.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
   2. Panelboards Containing Fusible Switches: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.

2.02 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.
   2. Ground Bus Material: Aluminum.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.
   2. Provide thermal magnetic circuit breakers unless otherwise indicated.
   3. Provide electronic trip circuit breakers where indicated.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.
   2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
   3. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   4. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
   5. Provide clear plastic circuit directory holder mounted on inside of door.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Aluminum.
   3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted or flush-mounted enclosures as indicated.
   2. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Bus Material: Aluminum or copper.

C. Circuit Breakers: Thermal magnetic plug-in type.

D. Enclosures:
   1. Provide flush-mounted enclosures unless otherwise indicated.
   2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
   6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

2.06 SOURCE QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 260526.

K. Install all field-installed branch devices, components, and accessories.

L. Provide filler plates to cover unused spaces in panelboards.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.

1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

F. Test GFCI circuit breakers to verify proper operation.

G. Test AFCI circuit breakers to verify proper operation.

H. Test shunt trips to verify proper operation.

I. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

J. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 262726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Fan speed controllers.

C. Receptacles.

D. Wall plates and covers.

1.02 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

K. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

L. UL 1699A - Outline of Investigation for Outlet Branch Circuit Arc-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

M. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

N. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
   4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
   1. Do not install wiring devices until final surface finishes and painting are complete.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
   1. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.

C. Samples: One for each type and color of device and wall plate specified.

D. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data:
   1. GFCI Receptacles: Include information on status indicators.
   2. Surge Protection Receptacles: Include information on status indicators.

H. Project Record Documents: Record actual installed locations of wiring devices.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

D. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratories (NRTL), and acceptable to authorities having jurisdiction.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Wiring Device Applications:
   1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
   2. Receptacles Installed in Dwelling Units: Use tamper-resistant receptacles.
   3. Provide GFCI protection for:
      a. Receptacles installed within 6 feet (1.8 m) of sinks.
      b. Receptacles installed in kitchens.
      c. Receptacles serving electric drinking fountains.

C. Wiring Device Finishes:
   1. Provide wiring device finishes as described below, unless otherwise indicated.
   2. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
   3. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
   4. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
   5. Wiring Devices Installed in Wet or Damp Locations: White with weatherproof cover.
   6. Surge Protection Receptacles: Blue.
   7. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.

2.02 WALL SWITCHES

A. General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

C. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts; illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.03 FAN SPEED CONTROLLERS

A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.
   1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

2.04 RECEPTACLES

A. General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. GFCI Receptacles:
   1. General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
      a. Provide test and reset buttons of same color as device.
   2. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
   3. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   4. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

C. AFCI Receptacles:
   1. General Requirements: Feed-through protection and light to indicate arc fault tripped condition and loss of protection; listed as complying with UL 1699A.
      a. Provide test and reset buttons of same color as device.

D. Surge Protection Receptacles:
   1. General Requirements: Listed and labeled as complying with UL 1449, Type 2 or 3.
      a. Energy Dissipation: Not less than 240 J per mode.
      b. Protected Modes: L-N, L-G, N-G.
      c. UL 1449 Voltage Protection Rating (VPR): Not more than 700 V for L-N, L-G modes and 1200 V for N-G mode.
      d. Diagnostics:
         1) Visual Notification: Provide indicator light to report functional status of surge protection.

2.05 WALL PLATES AND COVERS

A. Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; _____.
   3. Screws: Metal with slotted heads finished to match wall plate finish.
   4. Provide screwless wallplates with concealed mounting hardware where indicated.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that core drilled holes for poke-through assemblies are in proper locations.

H. Verify that openings in access floor are in proper locations.

I. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches (1200 mm) above finished floor.
      b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
      c. Fan Speed Controllers: 48 inches (1200 mm) above finished floor.
      d. Receptacles: 15 inches (_____ mm) above finished floor or 6 inches (150 mm) above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
   4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.

I. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

M. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

N. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Test each AFCI receptacle for proper tripping operation according to manufacturer's instructions.

G. Inspect each surge protection receptacle to verify surge protection is active.

H. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

D. Ballasts and drivers.

E. Emergency power supply units.

F. Lamps.

G. LED replacement lamps.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

B. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.

D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

H. UL 1598 - Luminaires; Current Edition, Including All Revisions.

I. UL 1993 - Self-Ballasted Lamps and Lamp Adapters; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:
   1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
   2. Provide photometric calculations where luminaires are proposed for substitution upon request.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

C. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.

D. Provide 3-year manufacturer warranty for LED replacement lamps.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:
   1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.04 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
   1. Number of Faces: Single- or double-face as indicated or as required for installed location.
   2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

2.05 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:
   1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
   2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.06 EMERGENCY POWER SUPPLY UNITS

A. Description: Self-contained emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

B. Compatibility:
   1. Drivers: Compatible standard, energy saving, and dimming AC LED drivers, including those with end of lamp life shutdown circuits.

C. Operation: Upon interruption of normal power source, solid-state control automatically switches connected lamps to emergency power supply for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

D. Diagnostics: Provide accessible and visible multi-chromatic combination test switch/indicator light to display charge, test, and diagnostic status and to manually activate emergency operation.

2.07 LAMPS

A. Lamps - General Requirements:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.

4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.08 LED REPLACEMENT LAMPS

A. Description: Light-emitting diode (LED) self-ballasted lamps listed as complying with UL 1993; intended for replacement of existing lamps of other light source types, including but not limited to, incandescent, fluorescent, and high intensity discharge (HID); suitable for installation in luminaire to be retrofitted.

B. LED Estimated Useful Life:
   1. Calculated based on IES LM-80 test data.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Emergency Lighting Units:

I. Exit Signs:

J. Fluorescent Emergency Power Supply Units:

K. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

C. Just prior to Substantial Completion, replace all lamps that have failed.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 265600
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Lamps.

D. LED replacement lamps.

E. Luminaire accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 265100 - Interior Lighting.

1.03 REFERENCE STANDARDS

A. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).

F. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 1598 - Luminaires; Current Edition, Including All Revisions.

I. UL 1993 - Self-Ballasted Lamps and Lamp Adapters; Current Edition, Including All Revisions.

J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
2. Provide photometric calculations where luminaires are proposed for substitution upon request.
3. Provide structural calculations for each pole proposed for substitution.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
   1. LED Luminaires:
      a. Include estimated useful life, calculated based on IES LM-80 test data.
      b. Include IES LM-79 test report upon request.

D. Field Quality Control Reports.
   1. Include test report indicating measured illumination levels.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

B. Substitutions: See Section 016000 - Product Requirements.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaires:
   1. Components: UL 8750 recognized or listed as applicable.
   2. Tested in accordance with IES LM-79 and IES LM-80.
   3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.03 BALLASTS AND DRIVERS

A. Manufacturers:
   1. Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
   2. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Ballasts/Drivers - General Requirements:
   1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
   2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
   3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

2.04 LAMPS

A. Lamps - General Requirements:
   1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
   2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
   3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
   4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect to be inconsistent in perceived color temperature.

2.05 LED REPLACEMENT LAMPS

A. Description: Light-emitting diode (LED) self-ballasted lamps listed as complying with UL 1993; intended for replacement of existing lamps of other light source types, including but not limited to, incandescent, fluorescent, and high intensity discharge (HID); suitable for installation in luminaire to be retrofitted.

B. LED Estimated Useful Life:
   1. Calculated based on IES LM-80 test data.
   2. Fluorescent Lamp Replacements: Minimum of 50,000 hours at 70 percent lumen maintenance.
   3. High Intensity Discharge (HID) Lamp Replacements: Minimum of 50,000 hours at 70 percent lumen maintenance.
   4. Incandescent Lamp Replacements: Minimum of 15,000 hours at 70 percent lumen maintenance.

2.06 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires in accordance with NECA/IESNA 501.

D. Provide required support and attachment in accordance with Section 260529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. Install lamps in each luminaire.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

E. Measure illumination levels at night with calibrated meters to verify compliance with performance requirements. Record test results in written report to be included with submittals.

3.05 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.06 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.

C. Just prior to Substantial Completion, replace all lamps that have failed.

3.08 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 284600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system and associated components, including control units, related equipment, initiating devices, and notification appliances.

1.02 ABBREVIATIONS AND ACRONYMS

A. AHJ: Authorities having jurisdiction.

B. BAS: Building automation system.

C. DMNS: Distributed mass notification system.

D. ECS: Emergency communications system.

E. EoL: End-of-line.

F. EVACS: Emergency voice/audio communication systems.

G. FACU: Fire alarm control unit.

H. HVAC: Heating, ventilation, and air conditioning.

I. IDC: Initiating device circuit.

J. LAN: Local area network.

K. MNS: Mass notification system.

L. NAC: Notification appliance circuit.

M. NPLFA: Non-power-limited fire alarm.

N. PLFA: Power-limited fire alarm.

O. SLC: Signaling line circuit.

P. SOO: Sequence of operation.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

D. NECA 90 - Standard for Commissioning Building Electrical Systems; 2015.

E. NECA 305 - Standard for Fire Alarm System Job Practices; 2018.

F. NFPA 3 - Standard for Commissioning of Fire Protection and Life Safety Systems; 2024.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

J. UL 38 - Standard for Manual Signaling Boxes for Fire Alarm Systems; Current Edition, Including All Revisions.

K. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.

L. UL 864 - Control Units and Accessories for Fire Alarm Systems; Current Edition, Including All Revisions.

M. UL 2075 - Standard for Gas and Vapor Detectors and Sensors; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate arrangement of equipment with dimensions and clearance requirements of actual equipment.
   2. Coordinate placement of devices and notification appliances with potential conflicts or view obstructions.
   3. Coordinate work to provide power for equipment at required locations (e.g., smoke dampers, type of actuators, line or local control transformer, zoning, grouping and circuit activations).
   4. Coordinate requirements for branch circuit protection, identification, and shunt trip if applicable.
   5. Coordinate reflected ceiling plans to avoid conflicting placements; maintain minimum diffuser and detector clearances as indicated.
   6. Coordinate submittals to confirm equipment and associated components are capable of indicated settings, and manufacturer documentation identifies required compatible product listings.
   7. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Verify exact termination locations required for boxes, enclosures, and equipment.
   2. Do not install devices or notification appliances until final surface finishes, painting, and cleaning are complete, unless otherwise required by AHJ.
   3. Do not begin installation of conductors and cables until installation of conduit and pathways between termination points is complete.
   4. Sequence work to protect cabling (e.g., overspray painting, physical stress, and insulation damage or covering markings).
   5. Verify naming convention for equipment identification, including room names and numbers, prior to creation of final drawings, reports, and labels.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Evidence of designer qualifications.

C. Comply with NFPA 72 chapter "Documentation," including noting names of installers, owners, and system classification information.

D. Design Documents: Submit all information required for plan review and permitting by AHJ, including floor plans, riser diagrams, and description of operation.
   1. Copy (if any) of list of data required by AHJ.
   2. NFPA 72 "Record of Completion", filled out to extent known at time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A, and complete listing of software required.
   4. Manufacturer's detailed product data sheet for each component, including wiring diagrams, and circuit length limitations. Catalog pages and product descriptions include ratings, dimensions, finishes, service conditions, and included features.
   5. Certification by manufacturer of FACU that system design complies with Contract Documents.
   6. Certification by Contractor that system design complies with Contract Documents.

E. Shop Drawings: Submit installation documentation required for plan review and permitting by AHJ, including floor plans showing locations of fire alarm system components, enlarged drawn to identified scale plan view, and riser diagrams.
   1. System zone boundaries and interfaces to fire safety systems.

2. Show locations of components, circuits, and raceways; mark components with identifiers used in control unit programming.
3. Include elevations and details of proposed equipment arrangements.
4. Include system interconnection schematic riser diagram showing proposed and approved cable size and type; coordinated with floor plans and describing circuit class, survivability, and application specific information required by NFPA 72.
5. Include typical wiring diagrams for devices, notification appliances, remote indicators, annunciators, remote test stations, and EoL and power supervisory devices.
6. Include requirements and control diagrams for interfacing with other systems.
7. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; standby and spare capacity calculations; notification appliance circuit loop resistance and voltage drop calculations, including spare capacity.
8. List of devices and notification appliances on each SLC, with spare capacity indicated.
9. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
10. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
11. Detailed drawing of graphic annunciators, displays, and interfaces.
12. Certification by either FACU manufacturer or manufacturer of related equipment.
13. Certification by FACU manufacturer that system design complies with Contract Documents.
14. Certification by Contractor that system design complies with Contract Documents.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Evidence of installer qualifications.

H. Evidence of maintenance contractor qualifications, if different from installer.

I. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test," filled out.

J. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of specified design documents, as approved by AHJ.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
8. Detailed but easy to read explanation of procedures require recording of system trouble events by qualified personnel, such as when routine testing is being conducted for fire drills and when entering into contracts for building renovations.

K. Project Record Documents: See Section 01 7800 for additional requirements, have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.

3. "As programmed" operating sequences, including control events by device, and updated input/output chart.

L. Closeout Documents:
1. Certification by manufacturer that system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
2. NFPA 72 "Record of Completion," filled out completely and signed by installer and authorized representative of AHJ.
3. Maintenance contract.

M. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.

1.06 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III (three) or Level IV (four) certified fire alarm technician or registered fire protection engineer, employed by FACU manufacturer, Contractor, or installer, with experience designing fire alarm systems in jurisdictional area of AHJ.

B. Installer Qualifications: Firm with minimum three years documented experience installing fire alarm systems of specified type and providing contract maintenance service as regular part of their business.
1. Authorized representative of FACU manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least two years of experience installing fire alarm systems.
3. Supervisor: Level III (three) or Level IV (four) certified fire alarm technician; furnish name and address.

C. Manufacturer Qualifications: Company specialized in manufacturing products specified in this section with at least three years of documented experience.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions and NECA 305.

C. Handle carefully to avoid damage to internal components, enclosure, and finish.

D. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

B. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

C. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (minus 10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

1.09 WARRANTY

PART 2 PRODUCTS

2.01 FIRE ALARM SYSTEM

A. General Requirements:
   1. Provide new fire alarm system complying with NFPA 70, NFPA 72, NFPA 90A, and consisting of required equipment, conduit, cabinets, outlet boxes, wiring, connectors, hardware, supports, accessories, components, software, and system programming as necessary for complete operating system that provides functional intent indicated.
   2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. 36 CFR 1191 and ADA Standards.
      b. Requirements of AHJ.
      c. Applicable local codes.
      d. Contract Documents.
      e. NFPA 72; "should" is mandatory; where conflicts between requirements require deviation, identify deviations clearly on design documents.
   3. Fire Alarm System Products:
      a. Listed, classified, and labeled as suitable for purpose intended.
      b. Installation Environments: Provide products suitable for their respective indoor applications.
   4. Fire Alarm System Design Information:
      a. Building Code: Comply with applicable building code.
         1) Principle Occupancy: As indicated on Architect code summary drawings.
         2) Principle Use: As indicated on Architect code summary drawings.
         3) High-Rise Type of Construction: As indicated on Architect code summary drawings.
      b. NFPA 72 Fire Alarm System Classification: Protected premises.
   5. Provide fire alarm circuits in accordance with NFPA 70.
      a. Comply with methods of interconnecting FACUs in accordance with NFPA 72 and NFPA 70.
      b. Power Sources:
         1) Comply with requirements for power supplies of emergency systems in accordance with NFPA 70.
         2) Primary: Dedicated branch circuits from facility power distribution system.
         3) Secondary: Storage batteries with capacity to operate system for period specified by NFPA 72.
            (a) Rechargeable Batteries: Listed and recognized by OSHA and acceptable to AHJ.
      c. Wiring and Wiring Methods:
         1) General Requirements:
            (a) Comply with requirements for wiring and wiring methods in accordance with NFPA 70.
            (b) Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum-rated, listed and labeled as suitable for use in return air plenums.
            (c) Special Occupancies: Comply with NFPA 70.
            (d) Comply with NFPA 70 for wire and cable plenum, riser, general-purpose, limited-use, undercarpet, and underground applications.
         2) Fire Alarm Circuits:
            (a) Comply with NFPA 70 for conditions and types required for multiconductor cable systems.
            (b) Non-Power-Limited Fire Alarm (NPLFA) Circuits:

(1) Provide dedicated NPLFA non-GFCI branch circuits for fire alarm equipment and marked by red identification in accordance with NFPA 70.

(c) Power-Limited Fire Alarm (PLFA) Circuits:

(1) Provide identification for PLFA circuits in accordance with NFPA 70.

6. Provide pathway class designations and pathway survivability, as defined in NFPA 72.
   a. Provide monitoring of conductors and other signaling channels for integrity and circuit performance.
   b. Pathway Class Designations:
      1) Unless otherwise indicated or required, pathways to meet the following requirements:
         (a) SLCs: Class B (star, tee-tap, multi-tap, with no return).
         (b) IDCs: Class B (daisy-chain with EoL resistor device installed at end of circuit).
         (c) NACs: Class B (daisy-chain with EoL resistor device installed at end of circuit).

B. Fire Alarm System Interfaces and Control Functions:
   1. UL 864 listed unless otherwise indicated.
   2. Descriptions below are intended to provide means for interface. See project SOOs, narrative, and input/output matrix for execution requirements.
   3. Provide initiating devices, interfaces, and control functions for emergency control function interfaces in accordance with NFPA 72.
   4. Provide monitoring of interconnected systems. Coordinate notification appliance alternate markings as indicated on drawings.

2.02 FIRE ALARM SYSTEM INITIATING DEVICES

A. General Requirements:
   1. Provide devices and associated accessories suitable for intended application and location to be installed. Unless otherwise indicated, use addressable devices and addressable interface modules only in clean, dry, indoor, nonhazardous locations.
   2. Surface-Mounted Devices: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.
   3. Devices for Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes or enclosures in accordance with product listing.
   4. Devices for Hazardous/Classified Locations: Listed and labeled as suitable for classification of installed location.

B. Manual Fire Alarm Boxes/Pull Stations:
   1. Description: Noncoded manual signaling boxes listed and labeled as complying with UL 38.
   2. Alarm Initiation: Configured for general alarm initiation unless otherwise indicated; presignal stations (where indicated) require use of key to initiate general alarm.
   3. Operation: Dual-action unless otherwise indicated or required.
      a. Dual-Action Operation: First requires pushing, pulling, or lifting, then pulling of lever.
   4. Color: Red, in accordance with NFPA 72.
   5. Station Reset: Requires use of key or tool.

C. Spot-Type Detectors:
   1. Utilize plug-in mounting to separate base with tamper-resistant feature; provide bases as indicated or as required.
   2. Smoke Detectors:
      a. Listed and labeled as complying with UL 268.
      b. Provide sensor type (e.g., photoelectric, ionization) as indicated.
   3. Carbon Monoxide Detectors:

a. Listed and labeled as complying with UL 2075.
b. Provide end-of-life notification.

2.03 FIRE ALARM SYSTEM NOTIFICATION APPLIANCES

A. General Requirements:
1. Provide signaling notification appliances listed for fire-protective service and intended operating mode, public or private; suitable for connection to FACU notification appliance circuits.
2. Provide notification appliances and associated accessories suitable for intended application and location to be installed. Use notification appliances only according to listed mounting (e.g. ceiling, wall).
3. Surface-Mounted Notification Appliances: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.
4. Exterior Notification:
a. In addition to required occupant notification, provide notification appliances on exterior of building.
5. Notification Appliance Derating: Include device derating adjustments in accordance with listing where applicable, including the following.
a. Where accessory protective guards or enclosures are utilized.
b. Where required by field conditions (e.g., ambient temperature and sound).
6. Notification Appliance Color:
a. Wall-Mounted: Red.
b. Ceiling-Mounted: White.
c. See drawings for mounting configuration indicated by symbols on floor plans, system interconnection diagrams, and details.

2.04 WIRE AND CABLE

A. General Requirements:
1. Comply with NFPA 70 listing and marking requirements for cables.
2. Substitution of fire alarm listed cables for communication wiring, in accordance with NFPA 70, is not permitted.
3. Provide cables as indicated or as required for connections between system components.

2.05 ACCESSORIES

A. Provide components as indicated or as required for connection of fire alarm system to devices and other systems indicated.

B. Provide EoL resistors as required for wiring supervision.

C. Protective Covers for Fire Alarm Devices:
1. Listed to same standard as device being protected.
2. Outdoor Covers: Weather resistant, suitable for outdoor use; use only with outdoor-rated devices.
3. Provide guards to protect devices where subject to mechanical damage; listed for use with detector.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements, including future system expansion as indicated on Contract Documents.

B. Verify that system capacities listed in manufacturer instructions align with designed system.

C. Verify that mounting surfaces are ready to accept components and equipment, with suitable support frames and anchors installed where required.

D. Verify ratings, configurations, and characteristics of system components.

E. Verify rough-ins for field connections.

F. Verify that work likely to damage fire alarm system has been completed.

G. Verify that interior of building has been protected from weather.

H. Perform preinstallation tests and inspections per manufacturer's instructions and in accordance with NECA 305.

I. Verify that system bonding is in accordance with Section 260526.

J. Do not energize system until deficiencies have been corrected.

K. Verify that branch circuit wiring installation is completed, tested, and ready for connection to fire alarm system. Overcurrent protection ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

3.02 PREPARATION

A. Prior to installation, confirm environment of installation area is clean, and with ambient temperature, humidity, and ventilation requirements are per manufacturer’s written instructions.
   1. Clean and vacuum in accordance with manufacturer's written instructions. Confirm equipment ventilation holes are absent of obstructions and free for air flow.
   2. Clean pathways thoroughly to remove foreign materials before installing conductors and cables.
   3. Clean dirt, debris, plaster, and other foreign materials from equipment enclosures, cabinets, and outlet boxes.
   4. Clean surfaces to receive adhesive products according to manufacturer's instructions.

B. Follow tool requirements for installation, including torquing adjustments, as listed in manufacturer documentation.

C. Remove detector dust covers prior to system energization.

3.03 INSTALLATION

A. Install field-devices, components, FACU and related equipment, and accessories in accordance with the following:
   1. Manufacturer's instructions, applicable codes, and Contract Documents.

B. Field Locations:
   1. Obtain Owner's approval of locations of devices and notification appliances before installation.
   2. Arrange equipment to provide minimum operational clearances and required maintenance access in accordance with manufacturer's instructions and NFPA 70.
   3. Conceal wiring, conduit, outlet boxes, and supports where installed in finished areas; maintain code-required access.

C. Raceways and Supports:
   1. Coordinate locations of outlet boxes as required for installation. Only install boxes and equipment at locations based on application standards indicated in NFPA 72.
   2. Secure and support raceways at intervals complying with NFPA 70. Provide supports where vertical rise exceeds permissible limits.
   3. Install firestopping to preserve fire resistance rating of partitions and other elements.

D. Wiring and Connections:
   1. Maintain separation of Class 1, Class 2, Class 3 remote-control, signaling, fire alarm circuits, and power-limited circuits in accordance with cable insulation class and NFPA 70.
   2. Maintain circuit pathway and class designations in accordance with NFPA 72 for configuration, separation, and survivability.
   3. Comply with permitted and not permitted installations for wires, cables, cable routing assemblies, communications circuits, and fire alarm circuits in accordance with NFPA 70.
   4. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by AHJ. Provide independent support from building structure and suspended ceiling systems. Do not provide support from raceways, piping, ductwork, or other systems.

5. Provide grounding and bonding in accordance with Section 260526.
6. Comply with manufacturer's minimum cable sizes or ratings.
7. Do not exceed manufacturer's recommended maximum power, signal, or network cable lengths between components.
8. Provide network wiring in accordance with NFPA 70.
9. Neatly train and bundle conductors inside boxes, wireways, and cabinets.
10. See manufacturer's instructions for batteries.

E. Fire Alarm System Components:
1. Install field-installed devices, components, relays, notification appliances, accessories, and when applicable EoL resistors.
   a. Install wiring to supervisory devices and associated EoL resistors as required for supervision of hardwired connections
2. Install Wall-Mounted Equipment: Assemble component hardware within (e.g., card bays, sub-bays, expansion bays, signal cards, other card frames, networking, signal transmission, application modules, tamper monitoring devices, interconnecting modules, and auxiliary power supplies), including space for required spare capacity, and configure settings.
3. Install Interconnect Wiring: Connect system cabinets, install processor and cards, cabling, connectors, terminations, and bonding.

F. Branch Power:
1. After installation confirmations, follow manufacturer instructions to connect branch circuit power cables to premises fire alarm system components; comply with NFPA 70.
2. Where accessories require auxiliary power, provide control power source and monitoring as indicated or as required to complete installation.
3. Install auxiliary power supplies, including indicated monitoring, and connections necessary for remote equipment.

G. System Identification:
1. Identify devices, notification appliances, components, cables, and equipment in accordance with approved submittals. See Section 260553.
2. Confirm fire alarm system programming meets requirements of SOO and sub-system SOOs.
3. Mark location of disconnecting means for NPFLA circuits.
4. Coordinate to provide red branch power circuit protective devices or identify them accordingly as required by NFPA 72 and NFPA 70.
5. Mark date of batteries installed on inside cover of panels and formal maintenance logs.

H. Troubleshooting and Installer Checks:
1. Field test connectivity periodically during installation process to avoid unexpected troubleshooting.
2. Check system operation for notification, FACU functions, circuit supervision, alarm initiating devices, supervisory initiating devices, dress panels/doors/covers, and programming before performing field tests.

I. Fire Alarm System Tests:
1. Perform required tests of NFPA 72. Record measured values during operational checks.
2. Confirm functional testing of fire alarm system is as indicated in Contract Documents.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Provide services of manufacturer's authorized representation to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's detailed testing procedures and field reports and with submittals.

C. Provide equipment, two-way radios for testing personnel use, tools, and supplies required to accomplish inspection and testing.

D. Notify Owner and Architect at least two weeks prior to scheduled inspections and tests.

E. Inspect and test in accordance with manufacturer's instructions.

F. Inspect wiring and components for damage and defects.

G. Batteries and Power Supplies: Perform inspections and tests listed in manufacturer installation instructions.

H. Perform additional requirements related to testing and inspection during system startup.

I. Test for interface with other systems.

J. Test shunt trips to verify operation.

K. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

L. Submit detailed reports indicated inspection and testing results, corrective actions taken, and as-found and final adjusted settings.

M. Diagnostic Period: After successful completion of inspections and tests, operate system to normal mode for at least 14 days without system or equipment malfunctions.

3.05 SYSTEM STARTUP

A. Obtain Owner approval prior to performing system startup.

B. Manufacturer Services: Provide services of manufacturer's authorized representation to systems startup. Include manufacturer's detailed startup procedures with submittals.

C. Prepare and start equipment and systems in accordance with manufacturer's instructions and recommendations.

3.06 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust initiating device and notification appliance settings to achieve desired operation as indicated in submittals.

C. Measure power supply primary and secondary voltages, log values for records, and make appropriate adjustments.

D. Adjust alignment of equipment covers and doors. Provide keys and spare keys to Owner.

E. Reprint and reinstall damaged or misinstalled labels; maintain neat and square to installed location good workmanship - see NECA 1; maintain consistent placements for identification on products of similar type.

F. Adjust devices or notification appliances and associated bases to be flush and level.

G. Program system parameters according to requirements of Owner.

3.07 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. See Section 017419 - Construction Waste Management and Disposal for field-generated construction waste requirements.

C. Check tightness of electrical connections. Replace damaged components and provide closure plates for vacant positions. Provide circuit directory updates for related power branch circuits.

D. Clean and repair existing materials and equipment that remain or are indicated for reuse.

E. Clean dirt, debris, plaster, and other foreign materials from outlet boxes and fire alarm system equipment and components.

F. Clean fire alarm system equipment and components according to manufacturer's instructions and NECA 305.

G. Clean surfaces and interiors of boxes and device cover plates in accordance with manufacturer's instructions to remove dirt, fingerprints, debris, plaster, and other foreign materials.

H. Repair scratched or marred exposed surfaces to match original factory finish.

I. Comply with federal (EPA), state, and local regulations for battery handling and disposal. Do not spill battery fluids down plumbing drains. Only use containers safe for transportation marked 'nonspillable.'

3.08 COMMISSIONING

A. See Section 019113 - General Commissioning Requirements for additional requirements.

B. Comply with NFPA 3 for commissioning of fire protection and life safety systems.

C. Comply with NECA 90 for commissioning building electrical systems.

D. Support Commissioning Agent in assembling test data and generating reports.

E. Participate in four hours of seasonal testing, as scheduled by Commissioning Agent, six months from Date of Substantial Completion.

3.09 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify AHJ and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide services of installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that work is complete and correct; perform preliminary tests as required.

E. Provide tools, software, and supplies required to accomplish inspection, testing, and document results.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of AHJ; document each inspection and test.

G. Correct defective work, adjust for operation, and retest until entire system complies with Contract Documents.

H. Diagnostic Period: After successful completion of inspections and tests, operate system in normal mode for at least 14 days without system or equipment malfunctions.
   1. Record system operations and malfunctions.
   2. If malfunction occurs, start diagnostic period over after correction of malfunction.
   3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
   4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.10 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.
   2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.

B. Administrative: One-hour session(s) covering issues necessary for nontechnical administrative staff; classroom:
   1. Initial Training: One session precloseout.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: One session precloseout.

D. Use operation and maintenance documentation as primary instruction material; have paper copies available for attendees and supplement training material aids.

3.11 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional submittals.

B. See Section 017900 - Demonstration and Training for additional requirements.

C. Closeout Demonstration: Demonstrate operation of all functions to Owner.
   1. Be prepared to conduct any of required tests.
   2. Have minimum one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of FACU manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by AHJ; notify AHJ with enough time to schedule demonstration.
   5. Repeat demonstration until successful.

D. Substantial Completion of project cannot be achieved until inspection and testing is successful and the following:
   1. Specified diagnostic period without malfunction has been completed.
   2. Approved operating and maintenance data has been delivered.
   3. Spare parts, extra materials, and tools have been delivered.
   4. All aspects of operation have been demonstrated to Owner.
   5. Final acceptance of fire alarm system has been given by AHJ.
   6. Specified precloseout instruction is complete.

E. Perform post-occupancy instruction within three months after Substantial Completion.

3.12 PROTECTION

A. Protect installed fire alarm system from subsequent construction operations.

3.13 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements for additional requirements relating to maintenance service.

B. Provide to Owner, at no extra cost, written maintenance contract for entire manufacturer's warranty period, to include work described below.

C. Provide to Owner as alternate to base bid separate maintenance contract for service and maintenance of fire alarm system for entire warranty period to include work described below; include complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with detailed schedule.

D. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond control of maintenance contractor.
   3. Record keeping required by NFPA 72 and AHJ.

E. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within two hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

F. Provide complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with detailed schedule.

G. Maintain on-site log listing date and time of each inspection and call-back visit, condition of system, nature of trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

H. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 311000
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and grubbing.

B. Selective removal and trimming.

C. Repair and restoration.

D. Debris removal.

1.02 RELATED REQUIREMENTS

A. Section 329300 - Plants: Relocation of existing trees, shrubs, and other plants; pruning.

1.03 REFERENCE STANDARDS

A. 29 CFR 1910.266 - Logging Operations; Current Edition.

B. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

C. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction); 2019.

D. ANSI Z133 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Site Plan:
   1. Indicate vegetation removal limits.
   2. Indicate areas for temporary construction and field offices.

C. Clearing Firm Qualification Statement: Documentation of specialized experience.

D. Photographs: Photographic documentation of existing vegetation.

1.05 QUALITY ASSURANCE

A. Clearing Firm Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.

B. Trimming or Pruning Qualifications: Tree Care Industry Association (TCIA) Certified Treecare Safety Professional.

1.06 FIELD CONDITIONS

A. Ambient Conditions: Terminate work during hazardous environmental conditions according to 29 CFR 1910.266.

B. Existing Conditions: See site drawing; see Section 003100 - Available Project Information.

C. Traffic: Comply with other requirements specified in Section 015500 - Vehicular Access and Parking.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sedimentation Barrier: See Section 015713 - Temporary Erosion and Sediment Control.

B. Tree Stump Killer: Application capable of preventing tree regrowth.

PART 3 EXECUTION

3.01 EXAMINATION

A. Comply with additional requirements specified in Section 017000 - Execution and Closeout Requirements.

B. Identify potential runoff areas.

C. Construction Fencing: See Section 015000 - Temporary Facilities and Controls.

D. Identify potential dust sources.

E. Identify preexisting debris, junk, and trash on-site.

3.02 PREPARATION

A. Coordinate work with utility companies; notify before starting work and comply with local requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are to remain.

E. Protect existing vegetation to remain from damage and monitor according to ANSI A300 Part 5.
   1. Photograph vegetation with documentation indicating data, time, weather, and brief description of health condition.

F. Install sedimentation barrier according to Section 015713 - Temporary Erosion and Sediment Control.

G. Develop dust remediation controls and methods. Do not use water if that results in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

H. Remove preexisting debris, junk, and trash on-site.

3.03 CLEARING AND GRUBBING

A. Clearing: Cut trees, stumps, shrubs, downed timber, and other vegetation for removal within identified area as indicated on drawings according to 29 CFR 1910.266. Follow recommendations of ANSI Z133 and best local practices for species involved.

B. Do not remove or damage vegetation beyond limits indicated on drawings.

C. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum subsoil disturbance.

3.04 SELECTIVE REMOVAL AND TRIMMING

A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.
   1. Includes trees, stumps, shrubs, downed timber, and other vegetation identified for removal as indicated on drawings.
   2. Fell trees away from vegetation identified to remain.
   3. Pull stumps, remove roots, buried timber, and other vegetation identified for removal 12 inches (30 cm), minimum depth, from ground. Remove rocks 6 inches (15 cm), minimum depth, from ground.
   4. Cut stump neatly and close to ground. Apply tree stump killer according to manufacturer's recommendations.
   5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and matching existing grade.

B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.
   1. Prune dead branches and balance overall appearance; see Section 329300.

3.05 REMOVED VEGETATION PROCESSING

A. Do not burn, bury, landfill, or leave on-site, except as indicated on drawings.

B. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; give preference to on-site uses.

3.06 REPAIR AND RESTORATION

A. Remaining Existing Facilities, Utilities, and Site Features: If damaged due to this work, repair or replace to original condition.

B. Vegetation: Replace damaged or destroyed vegetation identified to remain as indicated on drawings at no cost to Owner:
   1. Outside removal limits.

3.07 DEBRIS REMOVAL

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

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

C. Clean up spillage and windblown debris from public and private lands.

3.08 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.

C. Leave site clean and ready to receive work.

END OF SECTION

SECTION 312200
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Rough grading.

B. Fine grading.

1.02 REFERENCE STANDARDS

A. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

PART 2 PRODUCTS

2.01 MATERIALS

A. Gravel: Excavated on-site.
   1. Graded according to ASTM D2487 Group Symbol GW, GP, or SP.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify survey bench mark and intended elevations for grading areas are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.

3.03 ROUGH GRADING

A. Excavate and fill subgrade material to elevations indicated on plans.

B. Remove and replace unsuitable materials as specified fill.

3.04 FINE GRADING

A. Scrape and spread subgrade material uniformly smooth and without disruptions as indicated on drawings.

B. Slopes: Transition smoothly to adjacent areas.

3.05 TOLERANCES

A. Top Surface: Plus or minus 1/2 inch (13 mm).

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Leave site clean and raked, ready to receive work.

END OF SECTION

SECTION 312316.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Trench excavation.

B. Utility bedding and cover.

C. Backfill and compaction.

D. Dewatering.

1.02 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing.

B. Section 312200 - Grading.

1.03 DEFINITIONS

1.04 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

B. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil–Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).

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

D. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

E. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate trenching with utility installation.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. Crushed Stone: Crusher-run, mineral aggregate, free of silt, clay, loam, friable or soluble materials, and organic matter.

B. Concrete: Ready mix. As required to encase new electrical runs.
   1. Ready for placement in accordance with ASTM C94/C94M.

C. General Fill: Subsoil excavated on-site.

2.02 ACCESSORIES

A. Underground Warning Tape: Suitable for direct burial.
   1. Bright-colored, continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mils, 0.004 inch (0.10 mm) thick.

PART 3 EXECUTION

3.01 EXAMINATION

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 311000 for site clearing and topsoil removal.

C. Protect existing structures and fences from excavating equipment and vehicular traffic.

D. Protect plants, lawns, rock outcroppings, and other features to remain.

E. Locate and identify existing utilities to remain as indicated on drawings and protect from damage.

3.03 SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

B. Remove support and protection systems not required to remain in place, subject to approval of Architect.
   1. Prevent harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities, and utilities.

3.04 DEWATERING

A. Prevent surface water and groundwater from entering excavations and surrounding areas.

B. Dispose of water without causing surface erosion, sediment buildup, or endangering public health or property.

3.05 TRENCH EXCAVATION

A. Grade top perimeter of excavation to prevent surface water collection.

B. Notify Architect of unexpected subsurface conditions and discontinue affected work in area until notified to resume.

C. General: Cut trenches neat and clean.
   1. Slope banks of excavations deeper than 4 feet (1.2 m) to angle of repose or less until shored.
   2. Do not interfere with 45-degree bearing splay of foundations.
   3. Cut trenches wide enough to allow inspection of installed utilities.
   4. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

D. Utility Preparation: Rake trench bottom to uniform grade.
   1. Remove unsuitable subgrade and backfill.
   2. Compact subgrade to density equal to or greater than subsequent fill material requirements.

E. Maintain trenches and prevent loose soil or rocks from entering.

F. Remove excess excavated material from site.

G. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.06 UTILITY BEDDING AND COVER

A. Crushed Stone: Compact to 95 percent of maximum dry density.
   1. Bedding: Fill to subgrade elevation; rake smooth.

B. Concrete: Place in accordance with ACI PRC-304.

3.07 BACKFILL AND COMPACTION

A. Fill to subgrade elevations unless otherwise indicated on drawings.

B. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen, or spongy subgrade surfaces.

C. General Fill: Place and compact materials in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.

D. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

E. Compaction Density Unless Otherwise Specified or Indicated:
   1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
   2. At Other Locations: 95 percent of maximum dry density.

F. Underground Warning Tape:
   1. Install 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe.

3.08 FIELD QUALITY CONTROL

A. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.

3.09 PROTECTION

A. Divert surface water away from excavations.

B. Keep excavations free of standing water.

C. Maintain stability of banks and loose soils; prevent from falling into excavations.

D. Maintain excavations in neat and square, undisturbed condition.

END OF SECTION

SECTION 321216
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete re-paving.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. AI MS-2 - Asphalt Mix Design Methods; 2015.

B. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction; 2009a.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with State of Pennsylvania Public Work's standard.

B. Mixing Plant: Complying with State of Pennsylvania Highways standard.

C. Obtain materials from same source throughout.

PART 2 PRODUCTS

2.01 MATERIALS

A. Asphalt Cement: ASTM D946.

B. Aggregate for Wearing Course: In accordance with State of Pennsylvania Public Work's standards.

C. Tack Coat: Homogeneous, medium curing, liquid asphalt.

2.02 ASPHALT PAVING MIXES AND MIX DESIGN

A. Use dry material to avoid foaming. Mix uniformly.

B. Asphalt Wearing Course: 5 to 7 percent of asphalt cement by weight in mixture in accordance with AI MS-2.

C. Submit proposed mix design of each class of mix for review prior to beginning of work.

2.03 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd (1.5 L/sq m).

3.03 PLACING ASPHALT PAVEMENT - SINGLE COURSE

A. Install Work in accordance with State of Pennsylvania Public Work's standards.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Place asphalt to 1.5" inch compacted thickness (____ mm compacted thickness).

D. Install gutter drainage grilles and frames in correct position and elevation.

E. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

F. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch (6 mm) measured with 10 foot (3 m) straight edge.

B. Compacted Thickness: Within 1/4 inch (6 mm) of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch (12 mm).

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.06 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F (60 degrees C).

END OF SECTION

SECTION 321313
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Form materials.

B. Reinforcement.

C. Concrete materials.

1.02 RELATED REQUIREMENTS

A. Section 031000 - Concrete Forming and Accessories.

B. Section 033000 - Cast-in-Place Concrete.

C. Section 079200 - Joint Sealants: Sealing joints.

1.03 REFERENCE STANDARDS

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

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

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

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

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

F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2026.

G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.

H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.

I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2024.

J. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2024a.

K. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.

L. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.

M. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.

N. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2025.

O. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

P. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types); 2023.

Q. ASTM D1752 - Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; 2018 (Reapproved 2023).

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures, and curing compound.

C. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

PART 2 PRODUCTS

2.01 FORM MATERIALS

A. Form Materials: As specified in Section 031000, comply with ACI SPEC-301.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).
   1. Thickness: 1/2 inch (12 mm).
   2. Products:

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa) yield strength; deformed billet steel bars; unfinished.

B. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; galvanized.

C. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi (280 MPa) yield strength; deformed billet steel bars; unfinished finish.

2.03 CONCRETE MATERIALS

A. Obtain cementitious materials from same source throughout.

B. Cement: ASTM C150/C150M, Air Entraining - Type IIA Portland cement, gray color.

C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Water: Clean, and not detrimental to concrete.

G. Air-Entraining Admixtures: ASTM C260/C260M.

H. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing, Type C - Accelerating, and Type G - Water Reducing, High Range and Retarding.

2.04 ACCESSORIES

2.05 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 by manufacturer.

C. Concrete Properties:
   1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4,000 psi (_____ MPa).
   2. Total Air Content: 5-7 percent, determined in accordance with ASTM C173/C173M.

2.06 MIXING

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 SUBBASE

A. Prepare subbase 4" deep compacted gravel subbase per ACI 302

3.03 FORMING

A. Place and secure forms to correct location, dimension, profile, and gradient.

3.04 REINFORCEMENT

A. Place reinforcement at top of slabs-on-grade.

B. Interrupt reinforcement at expansion joints.

C. Place dowels to tie new sections of paving into existing. Provide #4 dowels at 12" on center and drilled 8" into existing adjacent paving.

3.05 COLD AND HOT WEATHER CONCRETING

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

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

C. Do not place concrete when base surface temperature is less than 40 degrees F (4 degrees C), or surface is wet or frozen.

3.06 PLACING CONCRETE

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

B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

3.07 JOINTS

A. Align joints with adjacent surfaces.

B. Place 3/8 inch (10 mm) wide control joints at 5 foot (____ m) intervals and to separate paving from vertical surfaces and other components.

3.08 FINISHING

A. Exterior Paving: Light broom, texture perpendicular to pavement direction.

3.09 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch (6 mm) in 10 ft (3 m).

B. Maximum Variation From True Position: 1/4 inch (6 mm).

3.10 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement for 7 days minimum after finishing.

END OF SECTION

SECTION 321710
PARKING BUMPERS AND MANUFACTURED TRAFFIC-CALMING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking bumpers.

1.02 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2026.

B. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.

C. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide unit configuration and dimensions.

C. Manufacturer's qualification statement.

D. Installer's qualification statement.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least 3 years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least 3 years of documented experience and approved by manufacturer.

1.05 FIELD CONDITIONS

A. Ambient Conditions: Do not apply adhesive when temperature is outside manufacturer's recommendations, when pavement is wet, or anticipating rain within 24 hours.

PART 2 PRODUCTS

2.01 PARKING BUMPERS

A. Nominal Size: 6 inches (152 mm) high, 8 inches (203 mm) wide, 6 feet (2 m) long.

B. Profile: Manufacturer's standard.

C. Anchoring Holes: Two, spaced equally.

D. Precast Concrete:
   1. Cement: Portland Type I - Normal in accordance with ASTM C150/C150M.
   2. Aggregate: Lightweight in accordance with ASTM C33/C33M.
   3. Reinforcement: Deformed, unfinished steel bars in accordance with ASTM A615/A615M.
   4. Color: Natural.

2.02 ACCESSORIES

A. Anchors: According to manufacturer's recommendations.

PART 3 EXECUTION

3.01 PREPARATION

A. Surface Preparation: Clean pavement surface and surrounding area.

3.02 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work, as indicated on drawings.

C. Asphalt Pavement: According to manufacturer's recommendations.
   1. Position unit in place.

2. Drill through anchoring holes and full depth of asphalt pavement.
3. Hammer anchor spike flush with top of unit.
4. Fill anchor hole annular space with grout or sealant.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Inspect for placement, as indicated on drawings.

C. Nonconforming Work: Remove and reinstall.

3.04 ADJUSTING

A. Limit adjustments and repositioning units within first hour of adhesive application.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove excessive adhesive immediately after application.

3.06 PROTECTION

A. Protect installed parking bumper from disturbance for 4 hours after adhesive application.

END OF SECTION

SECTION 321723
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Painted pavement markings.

1.02 REFERENCE STANDARDS

A. AASHTO MP 24 - Standard Specification for Waterborne White and Yellow Traffic Paints; 2015 (Reapproved 2020).

B. FHWA MUTCD - Manual on Uniform Traffic Control Devices; 2023.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Shop Drawings: Indicate survey control points and pavement markings.

C. Shop Drawings: Indicate traffic management plan with barricades, cones, and temporary markings.

D. Product Data: Manufacturer's data sheets on each product to be used.

E. Certificates: Submit for each batch stating compliance with specified requirements.
   1. Painted pavement markings.

F. Manufacturer's Instructions:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.

1.04 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 work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons (18 L) accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment, accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. 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. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.07 SEQUENCING

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of markings.

PART 2 PRODUCTS

2.01 PAINTED PAVEMENT MARKINGS

A. Comply with FHWA MUTCD.

B. Painted Pavement Markings: As indicated on drawings.

1. Marking Paint: In accordance with AASHTO MP 24.
    a. Parking Lots: Yellow.
    b. Symbols and Text: White.
    c. Wheelchair Symbols: Provide blue and white.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify existing markings for removal.

B. Verification of Conditions: Verify that pavement is dry and ready for installation.

C. Notify Architect of unsatisfactory conditions before proceeding.

3.02 PREPARATION

A. Establish survey control points for locating and dimensioning of markings.

B. Place barricades, warning signs, and flags as necessary to alert approaching traffic.

C. Clean surfaces prior to installation.
    1. Remove dust, dirt, and other debris.
    2. Remove rubber deposits, existing paint markings, and other coatings.

D. Temporary Markings: Apply as directed by Architect.

E. Apply paint stencils by type and color at necessary intervals.

3.03 INSTALLATION

A. General:
    1. Position pavement markings as indicated on drawings.
    2. Field location adjustments require approval of Architect.

B. Painted Pavement Markings:
    1. Apply in accordance with manufacturer's instructions.
    2. Apply in accordance with FHWA MUTCD standards.
    3. Marking Paint: Apply uniformly, with sharp edges.
        a. Applications: One coat.
        b. Wet Film Thickness: 0.015 inch (0.4 mm), minimum.
        c. Stencils: Lay flat against pavement, align with striping, remove after application.

3.04 TOLERANCES

A. Maximum Variation From True Position: 3 inches (76 mm).

B. Maximum Offset From True Alignment: 3 inches (76 mm).

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Perform field inspection for deviations from true alignment or material irregularities.

C. If inspections indicate work does not meet specified requirements, rework and reinspect at no cost to Owner.

D. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals for additional requirements.

B. Temporary Markings: Remove without damaging surfaces.

3.07 PROTECTION

A. Prevent approaching traffic from crossing newly applied pavement markings.

B. Replace damaged or removed markings at no additional cost to Owner.

C. Preserve survey control points until pavement marking acceptance.

END OF SECTION

SECTION 321731
STEEL GUARDRAIL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Steel guardrail and steel posts.

B. Excavating for post bases.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete foundation for posts.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

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

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

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on rail, posts, accessories, hardware and structural capabilities of rail section.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Comply with applicable code for rail height or location restrictions.

2.02 MATERIALS

A. Steel Posts: ASTM A501/A501M hot-formed tubing.

2.03 ACCESSORIES

A. Concrete: Type specified in Section 033000.

B. Hardware: Steel, bolts, nuts and washers to suit rail profile.

2.04 FINISHES

A. Components: Galvanized in accordance with ASTM A123/A123M.

B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install rails and posts and accessories in accordance with manufacturer's instructions.

B. Set top of rail at height indicated.

C. Space posts at intervals not exceeding 10 feet (3 m).

D. Space posts as indicated.

E. Set posts plumb, in concrete footings.

F. Attach rails securely to posts with anchoring hardware.

3.02 TOLERANCES

A. Posts - Maximum Variation From Plumb: 1/2 inch (12 mm).

B. Rail - Maximum Offset From True Position: 1 inch (25 mm).

C. Rail - Maximum Variation From True Height: 1/2 inch (12 mm).

D. Components shall not infringe adjacent property lines.

END OF SECTION

SECTION 323113
CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wire fabric.

C. Manual gates with related hardware.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.03 REFERENCE STANDARDS

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

B. 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; 2025.

C. ASTM F567 - Standard Practice for Installation of Chain-Link Fence; 2023.

D. ASTM F668 - Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and Other Polymer-Coated Steel Chain Link Fence Fabric; 2025.

E. ASTM F1043 - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework; 2018 (Reapproved 2022).

F. ASTM F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; 2018 (Reapproved 2022).

G. CLFMI CLF-FIG0111 - Field Inspection Guide; 2014.

H. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

I. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. See CLFMI CLF-SFR0111 for planning and design recommendations.

D. Samples: Submit two samples of fence fabric, 6 inch (____ mm) by 6 inch (____ mm) in size illustrating construction and colored finish.

E. Manufacturer's Installation Instructions: Indicate installation requirements, post foundation anchor bolt templates.

F. Manufacturer's Qualification Statement.

G. Fence Installer Qualification Statement.

1.05 QUALITY ASSURANCE

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

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Line Posts: 2.38 inch (60 mm) diameter.

B. Corner and Terminal Posts: 4.0 inch (100 mm) diameter.

C. Fabric: 2 inch (51 mm) diamond mesh interwoven wire, 6 gauge, 0.1920 inch (4.9 mm) thick, top selvage knuckle end closed, bottom selvage twisted tight.

D. Tension Wire: 6 gauge, 0.1920 inch (4.9 mm) thick steel, single strand.

E. Tie Wire: Aluminum alloy steel wire.

2.02 MATERIALS

A. Posts, Rails, and Frames: _____:
   1. ASTM A1011/A1011M, Designation SS; hot-rolled steel strip, cold formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi (345 MPa); zinc coating complying with ASTM F1043 and ASTM F1083.
   2. Line Posts: Type I round in accordance with FS RR-F-191/1D.
   3. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Wire Fabric: _____:
   1. ASTM F668 polymer-coated steel chain link fabric.

2.03 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Single Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches (1,525 mm) high, 3 for taller gates; Mortise latch with ADA compliant handle; keeper to hold gate in fully open position.

B. Hinges: Finished to match fence components.
   1. Brackets: Round.
   2. Mounting: Center.
   3. Closing: Self.

2.04 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter, set screw retainer.

2.05 FINISHES

A. Components and Fabric: Vinyl coated over coating of 1.8 ounces per square foot galvanizing (over coating of 550 g/sq m galvanizing).

B. Hardware: Hot-dip galvanized to weight required by ASTM A153/A153M.

C. Accessories: Same finish as framing.

D. Color(s): Medium Green. To be selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set intermediate posts plumb , in concrete footings with top of footing 2 inches above finish grade. Slope top of concrete for water runoff.

D. Provide top rail through line post tops and splice with 6 inch (150 mm) long rail sleeves.

E. Install center brace rail on corner gate leaves.

F. Stretch fabric between terminal posts or at intervals of 100 feet (30 m) maximum, whichever is less.

G. Position bottom of fabric 2 inches (50 mm) above finished grade.

H. Fasten fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches (380 mm) on centers.

3.02 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6 mm).

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Workmanship: Verify neat installation free of defects. See CLFMI CLF-FIG0111 for field inspection guidance.

3.04 CLEANING

A. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

B. Clean fence with mild household detergent and clean water rinse well.

C. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.05 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 323119
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Decorative steel fences.

1.02 REFERENCE STANDARDS

A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2025.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact); 1993 (Reapproved 2024).

D. ASTM D3359 - Standard Test Methods for Rating Adhesion by Tape Test; 2023.

E. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets; 2016 (Reapproved 2023).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Shop Drawings:
   1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
   2. Foundation details, concrete design mix and reinforcing schedule for anti-ram barrier system.

D. Field Inspection Records: Provide installation inspection records that include post settings, framework, fittings and accessories, gates, and workmanship.

E. Manufacturer's Warranty.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
   1. See Section 016000 - Product Requirements, for additional provisions.

1.05 DELIVERY, STORAGE AND HANDLING

A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

1.06 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 FENCES

A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:

B. Electro-Deposition Coating: Multistage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
   1. Total Coating Thickness: 2 mils (0.058 mm), minimum.
   2. Color: As selected by Architect from manufacturer's standard range.
   3. Coating Performance: Comply with general requirements of ASTM F2408.
      a. Adhesion: ASTM D3359 (Method B); Class 3B with 90 percent or more of coating remaining in tested area.
      b. Impact Resistance: ASTM D2794; 60 inch pounds (6.8 N m).

C. Steel: ASTM A653/A653M; tensile strength 45,000 psi (310 MPa), minimum.
   1. Hot-dip galvanized; ASTM A653/A653M, G60.
   2. 62 percent recycled steel, minimum.

D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.
   1. Tamper-proof security bolts.

E. Hinges: Finished to match fence components.
   1. Brackets: Round.
   2. Mounting: Center.
   3. Closing: Manual.

F. Latches: Finished to match fence components.
   1. Brackets: Round.
   2. Locking: Mechanical.

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. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Set fence posts in accordance with the manufacturer recommended spacing.

C. When cutting rails immediately seal the exposed surfaces by:
   1. Removing metal shavings from cut area.
   2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
   3. Apply two coats of custom finish spray paint matching fence color.
   4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
   1. Base type and quantity of gate hinges on the application, weight, height, and number of gate cycles.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch (6.3 mm).

B. Maximum Offset From Indicated Position: 1 inch (25.4 mm).

C. Minimum Distance from Property Line: 6 inches (152 mm).

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Post Settings: Randomly inspect three locations against design for:
   1. Hole diameter.
   2. Hole depth.
   3. Hole spacing.

D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

E. Gates: Inspect for level, plumb, and alignment.

F. Workmanship: Verify neat installation free of defects.

3.06 CLEANING

A. Leave immediate work area neat at end of work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

F. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.07 CLOSEOUT ACTIVITIES

A. Demonstrate proper operation of equipment to Owner's designated representative.

B. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
   3. Briefly describe function, operation, and maintenance of each component.

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 of training.

3.08 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 323223
SEGMENTAL RETAINING WALLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop drawings.

B. Retaining wall units.

C. Drainage filter.

D. Drainage fill.

E. Reinforced backfill.

F. Drainage pipe.

1.02 RELATED REQUIREMENTS

A. Section 311000 - Site Clearing: Removal of unwanted trees, bushes, and debris.

B. Section 334100 - Subdrainage.

1.03 REFERENCE STANDARDS

A. AASHTO M 288 - Standard Specification for Geosynthetics for Highway Applications; 2024.

B. ASTM C1372 - Standard Specification for Dry-Cast Segmental Retaining Wall Units; 2024.

C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).

E. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

F. ASTM D4491/D4491M - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 2022.

G. ASTM D4595 - Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method; 2017.

H. ASTM D4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile; 2021a.

I. ASTM D5262 - Standard Test Method for Determining the Unconfined Tension Creep and Creep Rupture Behavior of Planar Geosynthetics Used for Reinforcement Purposes; 2021.

J. ASTM D5321/D5321M - Standard Test Method for Determining the Shear Strength of Soil-Geosynthetic and Geosynthetic-Geosynthetic Interfaces by Direct Shear; 2021.

K. ASTM D5818 - Standard Practice for Exposure and Retrieval of Samples to Evaluate Installation Damage of Geosynthetics; 2022.

L. ASTM D6638 - Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks); 2018.

M. ASTM D7928 - Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis; 2021, with Editorial Revision.

N. NCMA TR-127 - Design Manual for Segmental Retaining Walls 3rd Edition; 2010 .

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of soil reinforcement with segmental retaining wall size, location, and installation of service utilities.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section with the material supplier, installer, and the Architect.

C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Engineering drawings for installation, including elevations, large-scale details of elevations, typical sections, details, and connections, soil reinforcement, and drainage provisions.
   1. Include marked up contract drawings showing exact dimensions for blocks, required coping, and other minor revisions.
   2. Design Data: Submit detailed design calculations showing compliance with specified design criteria and material evaluations performed in accordance with specified design standard, signed and sealed by Design Engineer.
   3. Submit no less than 2 weeks prior to start of work.

C. Design Engineer's Qualification Statement.

1.06 QUALITY ASSURANCE

A. Design Engineer Qualifications: Provide design by or under direct supervision of Professional Engineer experienced in the work of this section and licensed in the State in which the Project is located and:

1.07 DELIVERY, STORAGE, AND HANDLING

A. Confirm that the specified materials have been delivered. Provide a product certification with each shipment.

B. Store products above ground on wood pallets or blocking, in manufacturer's unopened packaging, until ready for installation.

C. Prevent excessive soil and mud from coming in contact with face of concrete units.

D. Protect material from damage. Do not use damaged material. Remove damaged material from the site.

E. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.08 FIELD CONDITIONS

A. Ambient Conditions: Do not install polymeric materials when temperatures are below minus 20 degrees F (minus 29 degrees C).

B. Existing Conditions: See subsurface investigation report; see Section 003100.

1.09 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 RETAINING WALLS

A. Architect has designed the retaining walls; alternative solutions will be considered provided Contractor provides complete engineering design at no extra cost to Owner.
   1. Alternative Solutions: Comply with requirements specified for substitution review.
   2. Shop drawing submittal is required only for approved alternative solutions.

B. Design Standard: Design retaining walls to be capable of withstanding the effects of gravity loads due to soil pressures resulting from grades indicated, determined in accordance with:
   1. In addition, comply with applicable local, state, and federal codes and regulations.
   2. This design method considers potential failure modes categorized by external, internal, local, compound, and global stability.

3. Provide engineering services as required for analysis for all modes of stability.
4. Use of design software for calculations is permitted.
5. Submit complete shop drawings showing all features of the design.

C. Shear Resistance: Design the wall not to exceed the capacity of materials and soils to resist shear:
1. Shear Resistance Between Units: Determine in accordance with ASTM D6916.
2. Connection Between Units and Soil Reinforcement: Determine in accordance with ASTM D6638. Strength shall exceed the maximum tensile force with a Factor of Safety of 1.5.
3. Coefficient for Direct Shear of Reinforcement on Soil: Determine in accordance with ASTM D5321/D5321M using soil similar in gradation and texture to that to be used for fill in the reinforced zone.

D. Soil Reinforcement:
1. Test reinforcement to be used in accordance with ASTM D6706 using soil taken from project site.
2. Do not use more than one type of reinforcement attached to units within the same wall; do not use products made by different manufacturers in the same wall; minimize the number of different reinforcement and filter products to avoid confusion in placement.
3. Walls Less Than 12 feet (3.5 m) High: Use only one type of reinforcement of one grade and strength.
4. Length Back from Wall: Not less than dimensions shown on drawings.
5. Long Term Design Strength of Reinforcement: LTDS = Tult / (RFd x RFid x RFcr), where:
a. Tult = Ultimate (tensile) strength per ASTM D4595.
b. RFd = Reduction Factor for chemical and biological durability; minimum 2.0 if durability testing has not been conducted, otherwise 1.1 for High-density polyethylene. (HDPE), and 1.1 for polyethylene terephthalate (PET).
c. RFid = Reduction Factor for Installation Damage; minimum 1.1 and 3.0 if testing per ASTM D5818 has not been conducted.
d. RFcr = Reduction Factor for Creep; consistent with test procedure used for determining the ultimate strength per ASTM D5262.
e. The product RFd x RFid x RFcr shall be greater than 2.0.

E. Drainage: Design to prevent water accumulation in retained soil; use drainage fill and drainage pipe as specified in Section 334100; provide outlets at 50 foot (15 m) intervals along length of wall, minimum.

F. Minimum Factor of Safety: Design with the following stability requirements:
1. Sliding = 1.5.
2. Pullout = 1.5.
3. Tensile Overstress = 1.5.
4. Overturning = 2.0.
5. Bearing Capacity = 2.0.

2.03 MATERIALS

A. Retaining Wall Units: Machine-formed concrete blocks of shapes and sizes suitable for the retaining wall configuration required and complying with ASTM C1372 and the following:
1. Product(s): 12" Ivany Block.
2. Face Color: Natural cement gray.
3. Texture: Smooth, on exposed surfaces.
4. Face Shape: Straight (flat).
5. Moisture Absorption: 8 percent, maximum.

B. Drainage Filter: Geosynthetic textile.
1. Apparent Opening Size: 70 to 100 U.S. Sieve size (150 to 212 micrometer), when tested in accordance with ASTM D4751.
2. Permittivity: 0.5 per second, minimum, when tested in accordance with ASTM D4491/D4491M.

3. Durability: Comply with minimum requirements of AASHTO M 288 Class 1; minimum mass of 8 ounces per square yard (270 g/sq m).

C. Drainage Fill: Clean, freely draining aggregate placed within, between, or immediately behind segmental retaining wall units; do not use pea gravel; use one of the following:
   1. Aggregate as approved by Architect.
   2. Aggregate meeting requirements of ASTM D448, Size No. 57.
   3. Crushed stone or coarse gravel, 3/8 inch (10 mm); no more than 5 percent passing No. 200 sieve.
   4. Crushed stone or coarse gravel, meeting requirements of ASTM D7928.

D. Reinforced Backfill: Compacted soil placed behind drainage fill within reinforced soil mass; do not use heavy clay or organic soils; comply with one of the following:
   1. Use site-excavated or other soil approved by Architect.
   2. Granular soil with less than 35 percent passing No. 200 sieve per ASTM D7928.
   3. Inorganic ASTM D2487 soil types GP, GW, SP, or SM, free of debris.
      a. Maximum Size: 3/4 inch (19 mm), unless approved by Design Engineer, and design strength reduced to account for additional installation damage.
      b. Plasticity of Fines: Less than 10. Liquid Limit: Less than 40, when tested in accordance with ASTM D4318.

E. Drainage Pipe: 4 inch (100 mm) Perforated schedule 40 PVC, complying with ASTM D3034; or corrugated HDPE complying with ASTM F405; with geotextile filter wrap.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify location of existing structures and utilities prior to excavation.

B. Protect adjacent structures from the effects of excavation.

C. Verify that layout dimensions are correct and substrate is in proper condition for installation.

D. Notify Architect of unsatisfactory conditions.

E. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Sitework:
   1. Remove unwanted trees, bushes, and debris as specified in Section 311000.

B. Excavation:
   1. Excavate to lines and grades indicated on drawings.
   2. Do not disturb embankment or foundation beyond lines. Minimize over-excavation; fill over-excavated areas with compacted reinforced backfill or leveling pad material at Contractor's expense.
   3. After excavation, and prior to placement of leveling materials, Geotechnical Engineer will examine bearing soil surface to verify strength meets or exceeds design requirements and assumptions.
   4. Replace unsuitable bearing soil as directed by Architect.

C. Leveling Pad:
   1. Width: 6 inches (152 mm) minimum extension beyond front and back faces of units.
   2. In lieu of pad made solely of aggregate or concrete, pad may be 3 inches (75 mm), minimum, of thick compacted sand or crushed rock, covered with 2 inches (50 mm) to 3 inches (75 mm) of unreinforced concrete.
   3. Location: Top of pad at 1 inch (25 mm) below grade for each 8 inches (200 mm) that wall extends above grade.
   4. Compact aggregate to lines and grades on drawings, in lifts 6 inches (152 mm) thick, maximum.
   5. Use only hand-operated compaction equipment within 36 inches (1 m) of back of wall.

D. Verify level grade before proceeding.

E. Install drainage collection pipe with a continuous fall in the direction of flow. Cap open ends as necessary to prevent soil and debris from entering.

3.03 INSTALLATION

A. Install in accordance with drawings, manufacturer instructions, and applicable codes and regulations.

B. Segmental Retaining Wall Units:
   1. Place first course of units on leveling pad; check alignment and level. Check for full contact with base and for stability.
   2. Place units side by side for full length of wall, aligning back face of straight walls using string line or offset from base line and back face of curved walls using flexible pipe or other method recommended by manufacturer.
   3. Do not leave gaps between units.
   4. Lay out corners and curves in accordance with manufacturer's instructions. Do not leave gaps to produce wall batter or curvature.
   5. Cut blocks with saw; do not split units.
   6. Sweep excess material from tops of units before laying succeeding courses.
   7. Place a maximum of 2 succeeding courses above level backfill. Check for proper alignment and batter.
   8. Where top of wall changes elevation, step units to match grade or turn top course into embankment.
   9. Where bottom of wall changes elevation, step base leveling pad and extend lowest course a minimum of two units into slope.
   10. Install shear connectors per manufacturer recommendations.

C. Soil Reinforcement: Install each layer on fully compacted fill.
   1. Orient soil reinforcement material with highest strength axis perpendicular to wall alignment.
   2. Attach to top of wall units and extend horizontally, full length, over compacted backfill slightly sloping downward away from wall.
   3. Install in one piece lengths with 100 percent coverage in each layer at each level. Do not splice or leave gaps between panels or ends of pieces.
   4. Pull taut and remove slack prior to backfill placement.

D. Drainage Fill: Place drainage fill in, between, and behind units.
   1. Compact to lines and grades on drawings, in lifts 6 inches (152 mm) thick, maximum; decrease lift thickness where necessary to achieve required density.
   2. Extend drainage fill 6 inches (150 mm) beyond back face of units.
   3. Base of drainage fill elevation shall not exceed two courses or 16 inches (400 mm) from base of wall units.

E. Backfill: Place, spread, and compact backfill from behind drainage fill to undisturbed soil while minimizing the development of slack in the soil reinforcement.
   1. Use only lightweight hand-operated compaction equipment within 3 feet (900 mm) from back wall face, or one half of wall height, whichever is greater.
   2. Place backfill in lifts of maximum 6 inches (150 mm) to 8 inches (200 mm) loose thickness where hand compaction is used and 8 inches (200 mm) to 10 inches (250 mm) where heavy compaction equipment is used.
   3. Compact backfill to 95 percent maximum density and upper 2 feet (600 mm) of backfill to 98 percent maximum density, standard Proctor, as determined in accordance with ASTM D698, or as recommended by Geotechnical Engineer.
   4. Moisture content of backfill prior to and during compaction to be within plus or minus 2 percentage points dry of optimum and uniform throughout each layer.

5. Do not operate tracked construction equipment directly upon soil reinforcement. Maintain a minimum fill thickness of 6 inches (150 mm) for operation of tracked vehicles over soil reinforcement. Minimize turning of tracked vehicles while over soil reinforcement.
6. Operate wheeled equipment at speeds less than 10 miles per hour (16 kph) over soil reinforcement.
7. Prevent contamination of the filter fabric, unit fill, blanket drains, chimney drains, and/or drainage composite from poor drainage materials such as fine grained silt and clay.

F. Cap Units: Install and top two courses of units with masonry adhesive.
1. Verify in-place top of wall elevation prior to installation of cap units and adjust accordingly.
2. Clear cap units and top course of segmental retaining wall units of debris and standing water before applying adhesive.
3. Apply masonry adhesive to top surface of top unit and place cap into position over projecting pins. Protect wall face from masonry adhesive.

G. Site Drainage:
1. At end of each day:
a. Grade backfill a minimum of 2 percent away from wall to prevent runoff from adjacent areas from entering wall site and to prevent ponding at the wall.
b. Construct a berm at the crest of the wall to prevent surface water from overtopping.
2. At completion, if other work adjacent to wall is not to be done immediately (paving, landscaping, etc), grade top of backfill and provide temporary drainage to prevent water runoff toward the wall.
3. Surface water control and groundwater seepage shall be the responsibility of the project Architect.

3.04 TOLERANCES

A. Top of Wall:
1. Plan Location: Maximum of plus/minus 1 inch (25 mm) from plan location.
2. Elevation: Maximum of plus/minus 1-1/2 inch (38 mm) from elevations shown on drawings.

B. Face of Wall Flatness: Measured as deviation from a straight edge.
1. In the Vertical Dimension: Plus/minus 1-1/4 inch per 10 foot (31.75 mm in 3 m) section.
2. In the Horizontal Dimension of Straight Walls: Plus/minus 1-1/2 inch per 10 foot (37.5 mm in 3 m) section.

C. Overall Wall Batter: Within 2 degrees of design, measured from the vertical.

D. Gap Between Adjacent Units: 1/8 inch (3 mm), maximum.

3.05 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Provide manufacturer's field representative to observe and inspect concrete units.

C. Observe and inspect:
1. Concrete units: For correct type, for quality installation with courses that are level and follow the designed batter ratio.
2. Soil backfill: For correct type, for specified compaction with level grading prior to reinforcement installation.
3. Soil reinforcement: For correct type, for solid connection to concrete units, and for smooth and taut installation.
4. Field location in plan and elevation.

D. Soil Tests: For every new soil type and/or for every 2,000 cubic yard per running foot (1,500 cm/m) perform Atterberg Limit, Sieve Analysis, and Proctor Compaction tests. Perform additional testing per project Architect.

E. Owner will engage inspection and testing services, including independent laboratories, to provide quality assurance and testing services during construction. Contractor will secure necessary construction control testing during construction.

F. Correct work found deficient and not in accordance with drawings and specifications.

3.06 CLEANING

A. Clean wall face to remove debris and stains.

B. Leave adjacent paved areas broom clean.

C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

3.07 PROTECTION

A. Prevent damage to wall and earthwork by subsequent construction and uncontrolled runoff until substantial completion; repair damage due to failure to protect wall or earthwork.

B. Do not operate equipment with wheel loads in excess of 150 pounds per square foot (1000 kPa) live load within 10 feet (3 m) from the wall face.

C. Do not place temporary soil or fill stockpiles adjacent to wall.

3.08 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide a separate maintenance contract for specified maintenance service.

C. Annually clear any debris from the heel and toe drains that may cause blockage or damage.

D. Annually inspect the top, ends, and bottom of the segmental retaining wall for signs of erosion. Report any deflection or movement to a qualified Architect.

E. Weekly mow landscaped areas preventing plant or tree growth.

END OF SECTION

SECTION 323300
SITE FURNISHINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Benches.

B. Bollards.

C. Planters.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Bollard infill and underground encasement.

B. Section 055000 - Metal Fabrications: Anchors to attach site furnishings to mounting surfaces.

1.03 REFERENCE STANDARDS

A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, and maintenance information.

C. Shop Drawings: Indicate plans for each unit or group of units, elevations with model number, overall dimensions, construction, and anchorage details.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer’s warranty against defects in materials or workmanship for ductile iron castings for a period of 10 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Precast Furnishings:
   1. Petersen Manufacturing Co., Inc; P24X24 Security Planter 24 Inch Height, Grey, Light Sand Blast: www.petersenmfg.com/#sle.
   2. Belon Outdoors, P-24x24, Dove Gray, Light Sand Blast Finish .

2.02 METAL FURNISHINGS

A. Benches: Metal frame and seat section with back.
   1. Frame: Steel.
   2. Seat: Recycled plastic slat.
   3. Mounting: Surface.

2.03 PRECAST CONCRETE FURNISHINGS

A. Precast Concrete Furnishings, General:
   1. Precast Concrete Components: Mixture of cement, aggregates, water, and mineral colors; molded to shape, and reinforced with steel bars.
      a. Finish:
         1) Horizontal Surfaces: Smooth for seats and table tops.
         2) Vertical Surfaces: Smooth for supports and sides.
      b. Color: As selected by Architect from manufacturer's standard range.
      c. Clear Sealers: Anti-graffiti.
   2. Hardware: Stainless steel.

B. Planters: Precast concrete with drain holes.

1. Shape: Square.
2. Length: 24" inches (____ mm).
3. Width: 24" inches (____ mm).
4. Height: 24" inches (____ mm).
5. Mounting: Surface, using epoxy adhesive.
6. Interior Water Sealant: Elastomeric coating.

2.04 BOLLARDS

A. Steel Pipe Bollards: Hollow steel pipe with plain shaft.
   1. Shape: cylindrical.
   2. Height Above Grade: 42" inches (____ mm).
   3. Depth Below Grade: 36" inches (____ mm).
   4. Cap: Formed steel dome.
   5. Materials:
      a. Steel Pipe: ASTM A53/A53M, standard weight.
      b. Factory Finish: Manufacturer's standard.
      c. Color: As selected by Architect from manufacturer's standard range.
   6. Mounting: Removable.

B. Precast Concrete Bollards:
   1. Shape: Round.
   2. Diameter: 6" inches (____ mm).
   3. Height Above Grade: 42" inches (____ mm).
   4. Height Below Grade: 36" inches (____ mm).
   5. Mounting: In-ground.

C. Bollard Covers: High density polyethylene, mounted over existing bollard.
   1. Cap: Formed dome.
   2. Factory Finish: Primed.
   3. Color: As indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify proper installation of mounting surfaces, preinstalled anchor bolts, and other mounting devices; and ready to receive site furnishing items.

B. See Section 055000 for anchors to attach site furnishings to mounting surfaces.

C. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install site furnishings in accordance with approved shop drawings, and manufacturer's installation instructions.

B. See Section 033000 for bollard infill and underground encasement.

C. Provide level mounting surfaces for site furnishing items.

END OF SECTION

SECTION 329219
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. Soil pH neutralizer.

1.02 RELATED REQUIREMENTS

A. Section 312200 - Grading.

1.03 DEFINITIONS

A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable. Deliver seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 PRODUCTS

2.01 SEED MIXTURE

A. Seed Mixture:
   1. Merion Blue Grass: 20 percent.
   2. Kentucky Blue Grass: 40 percent.
   3. Creeping Red Fescue Grass: 25 percent.
   4. Norlea Perennial Rye: 15 percent.

B. Regulatory Requirements:
   1. Comply with regulatory agencies for fertilizer and herbicide composition.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

2.02 SOIL MATERIALS

A. Topsoil: Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds and roots; pH value of minimum 5.4 and maximum 7.0.

B. Regulatory Requirements:
   1. Comply with regulatory agencies for fertilizer and herbicide composition.
   2. Provide certificate of compliance from authority having jurisdiction indicating approval of seed mixture.

2.03 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.

B. Fertilizer: Recommended for grass, slow release nitrogen, biological materials, and biostimulant materials; of proportion necessary to eliminate deficiencies of topsoil.

C. Soil pH Neutralizer: Recommended for planting and re-vegetating areas with acidic soils, as indicated by analysis.

D. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.

E. Erosion Fabric: Jute matting, open weave.

F. Stakes: Softwood lumber, chisel pointed.

G. String: Inorganic fiber.

H. Edging: Galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared soil base is ready to receive the work of this Section.

3.02 PREPARATION

A. Prepare subgrade in accordance with Section 312200.

B. Place topsoil in accordance with Section 329119.

C. Install edging at periphery of seeded areas in straight lines to consistent depth.

3.03 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

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 (50 mm) of topsoil.

E. Lightly water to aid the dissipation of fertilizer.

3.04 SOIL NEUTRALIZER

A. Apply in accordance with manufacturer's instructions.

B. Apply after smooth raking of topsoil and prior to roller compaction.

C. Do not apply soil neutralizer at same time or with same machine used to apply seed.

D. Mix thoroughly into upper 2 inches (50 mm) of topsoil.

E. Lightly water to aid dissipation.

3.05 SEEDING

A. Apply seed at a rate of 5 lb per 1000 sf evenly in two intersecting directions. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Do not sow immediately following rain, when ground is too dry, or during windy periods.

D. Immediately following seeding and compacting, apply mulch to a thickness of 1/8 inches (3 mm). Maintain clear of shrubs and trees.

E. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.

F. Following germination, immediately re-seed areas without germinated seeds that are larger than 4 by 4 inches (100 by 100 mm).

3.06 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean surrounding areas of construction debris.

3.07 PROTECTION

A. Cover seeded slopes where grade is 4 inches per foot (____ mm per m) or greater with erosion fabric. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6 inch (150 mm) deep excavated topsoil trench. Provide 12 inch (300 mm) overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch (900 mm) intervals with stakes.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches (150 mm).

3.08 MAINTENANCE

A. See Section 017000 - Execution Requirements, for additional requirements relating to maintenance service.

B. Cleanup:
   1. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.
   2. Remove and dispose of general cleanup debris and biodegradable debris; Owner's trash collection facilities may be used.
   3. Remove and dispose of general cleanup debris and biodegradable debris.
      a. Biodegradable Debris: Deposit biodegradable debris in Owner's designated on-site compost pile, branches and bark are not considered biodegradable.
      b. Branches and Bark: Machine-chip branch and bark debris; deposit resulting debris in Owner's designated wood chip storage area.
      c. Non-Biodegradable Debris: Owner's trash collection facilities may not be used; dispose of off-site in accordance with applicable regulations.

END OF SECTION

SECTION 329300
PLANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil.

B. Placing topsoil.

C. New trees, plants, and ground cover.

D. Maintenance.

E. Tree Pruning.

1.02 REFERENCE STANDARDS

A. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.

B. ANSI Z133.1 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

C. ANSI/AHIA Z60.2 - American Standard for Nursery Stock; 2025.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Certificate: Certify fertilizer and herbicide mixture approval by authority having jurisdiction.

C. Certificate: Submit certificate for plants free of disease or hazardous insects; certified by federal department of agriculture; free of disease or hazardous insects.

D. Maintenance Data: Include cutting and trimming method ; types, application frequency, and recommended coverage of fertilizer .

E. Submit list of plant life sources.

1.04 QUALITY ASSURANCE

A. Tree Pruning: Comply with ANSI A300 Part 1.

B. Non-native, Invasive Plant Species: Do not introduce, grow, or cultivate plant species that are non-native to the ecosystem of the project site, and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

1. Comply with laws regulating non-native and invasive plant species in the State in which the Project is located.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

B. Protect and maintain plant life until planted.

C. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.06 FIELD CONDITIONS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F (2 degrees C) or rise above 90 degrees F (32 degrees C).

B. Do not install plant life when wind velocity exceeds 30 mph (48 k/hr).

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide one year warranty.

C. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.

D. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

PART 2 PRODUCTS

2.01 PLANTS

A. Plants: Species and size identified in plant schedule, grown in climatic conditions similar to those in locality of the work according to ANSI/AHIA Z60.2.

2.02 SOIL AMENDMENT MATERIALS

A. Water: Clean, fresh, and free of substances or matter that could inhibit vigorous growth of plants.

B. Fertilizer: Containing fifty percent of the elements derived from organic sources; of proportion necessary to eliminate any deficiencies of topsoil, as indicated in analysis.

2.03 ACCESSORIES

A. Wrapping Materials: Burlap.

B. Stakes: Softwood lumber, pointed end.

C. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

D. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil and planters are ready to receive work.

B. Saturate soil with water to test drainage.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 3 inches (75 mm) where plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds 6 inches (150 mm) larger than plant root system.

3.03 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches (100 mm) over area to be planted. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install topsoil into pits and beds intended for plant root balls, to a minimum thickness of 6 inches (150 mm).

3.04 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches (50 mm) of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.05 PLANTING

A. Place plants for best appearance for review and final orientation by Architect.

B. Set plants vertical.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth of 6 inches (of 150 mm) under each plant. Remove burlap, ropes, and wires, from the root ball.

E. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch (150 mm) layers. Maintain plant life in vertical position.

F. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.06 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes to the following:
   1. Tree Caliper: 1 inch (25 mm); Tree Support Method: 1 stake with one tie
   2. Tree Caliper: 1 to 2 inches (25 to 50 mm); Tree Support Method: 2 stakes with two ties
   3. Tree Caliper: 2 to 4 inches (50 to 100 mm); Tree Support Method: 3 guy wires with eye bolts and turn buckles
   4. Tree Caliper: Over 4 inches (100 mm); Tree Support Method: 4 guy wires with eye bolts and turn buckles

3.07 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 014000.

B. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.08 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Clean surrounding areas of construction debris.

3.09 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Tree and Shrub Maintenance:
   1. Consider trees dead when main leader has died or when 25 percent or more of crown has died.
   2. Consider shrubs dead when 25 percent or more of plant has died.
   3. Inspect woody plants for health by scraping up to 1/16-inch (2 mm) square area of bark.
   4. Adjust stakes, guys and turnbuckles, ties, and trunk wrap as required to promote growth and avoid girdling.
   5. Pruning: Unless otherwise indicated, prune only to maintain balanced natural shape; comply with recommendations of ANSI A300 Part 1, ANSI Z133.1, and best local practices for species involved.
   6. Shrubs: Prune at least once during maintenance period at best time to influence ultimate shape and size for particular species.
      a. Prune to balance plant's form and according to its natural growth characteristics.
      b. Remove water shoots, suckers, and branches not complying with desired shape and size.
   7. Renovation of Established Trees:
      a. Remove growth obstructing traffic signs or vision at street intersections.
      b. Remove low-hanging branches over vehicular traffic routes to height necessary to clear expected traffic, including buses and moving vans.

C. Cleanup:

1. Clean adjacent pavements of plant debris and other debris generated by maintenance activities.
2. Remove and dispose of general cleanup debris and biodegradable debris; Owner's trash collection facilities may not be used; dispose of off-site in accordance with applicable regulations.
3. Remove and dispose of general cleanup debris and biodegradable debris.
    a. Biodegradable Debris: Deposit biodegradable debris in Owner's designate on-site compost pile; branches and bark are not considered biodegradable.
    b. Branches and Bark: Machine-chip branch and bark debris; deposit resulting debris in Owner's designated wood chip storage area.
    c. Non-Biodegradable Debris: Owner's trash collection facilities may not be used; dispose of off-site in accordance with applicable regulations.

END OF SECTION