BEATTY WELLNESS CENTER
ISSUED FOR BID

SEPTEMBER 04, 2026 SAA Project No. 26109.01

PROJECT SPECIFICATION

Project:
BEATTY WELLNESS CENTER
24110 Godowa Springs Road
Beatty, OR 97621

Owner:
KLAMATH TRIBAL HEALTH AND FAMILY SERVICES
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SECTION 010500
CONSTRUCTION STAKING

PART 1 GENERAL

1.01 CONTRACT CONDITIONS

A. Work of this Section is bound by the General Conditions, Supplementary Conditions, and Division 1 bound herewith in addition to this Specification and accompanying Drawings.

1.02 WORK INCLUDED

A. Provide survey work by an Oregon State registered land surveyor for the execution of Project.

1.03 QUALITY CONTROL

A. Before starting work, the Contractor shall locate all general reference points. The Contractor shall employ a registered surveyor (licensed by the State of Oregon) to perform such work. The Contractor shall take such steps as are necessary to prevent the dislocation or destruction of the reference points, and shall be responsible for the accuracy of the site and building layout and elevations for the work.

1.04 SURVEY REFERENCE POINTS

A. Existing Points: See Drawings.
   1. Locate existing points prior to starting site work, and preserve during construction.
   2. Make no Changes to existing points without Owner and Architect approval.
   3. Notify Owner and Architect when any point is lost, destroyed or requires relocation.

1.05 PROJECT LAYOUT

A. Establish existing control points.

B. Record benchmark locations with horizontal and vertical dimensions on Project Record Drawings.

C. Using survey instruments, establish lines and levels for the following:

D. Stakes for grading, fill, and all earthwork.

E. Building foundation, floor elevations and similar elements.

F. Re-establish control points as required due to construction activity.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION 010500

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SECTION 010900
UTILITY LOCATION REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. Upon notification from any of the public agencies or utilities that the Contractor has caused damage to any facility, equipment or installation of the agency, and the Contractor failed to request a utility locate service from said utility at least two (2) normal business days prior to the damage, or if the locate service was properly requested and the damage was not caused by an error in the locate service, the Owner will withhold from forthcoming or accrued Contract payment, including advances, a sum sufficient to protect the agency of utility from loss.

B. Upon receipt of a release of claim by the notifying utility or upon judgment of a court having jurisdiction in the matter and having established that the contractor is liable for a lesser amount or is not liable for a lesser amount or is not liable for the damage, the Owner will release the excess funds to the Contractor. Funds withheld pursuant to this provision shall not bear interest. Upon receipt of satisfactory evidence against the Contractor in a court of competent jurisdiction within sixty (60) days after discovery of the damage, the Owner shall release the funds withheld pursuant to this provision.

1.02 PROTECTION OF UTILITIES

A. Any pipes or other utilities encountered in the excavation shall be shored up and cared for by the Contractor as to leave them in a proper working condition until such times as the Owner shall determine what shall be done with them.

B. Any utilities mislocated or inadequately located by the appropriate utility company which is damaged by the contractor shall not constitute reimbursement or time extension to the Contractor from the Owner for repair(s) of work that the Contractor performs.

C. No underground utility or structures shall be backfilled until they are inspected and approved by the Owner. The Contractor shall give the Owner twenty-four (24) hours notice of his intention to backfill or cover his work. Any work covered up without approval or proper required inspection shall, upon request of the Owner, be uncovered for inspection at the expense of the Contractor. If the law or ordinance of any public authority requires any work to be tested, approved, or inspected, the Contractor shall arrange an appointment and a fixed date for such inspection.

PART 2 PRODUCTS

2.01 NOT USED

PART 3 EXECUTION

3.01 NOT USED

END OF SECTION 010900

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SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: Klamath Tribal Health and Family Services Fitness Wellness Center.

B. The Project consists of the construction of A new 4,064 SF Wellness Center in Beatty, Oregon.The project consists of a Community Room, A workout room, medical and dental offices, offices, restrooms, and showers..

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price, Contract will be between General Contractor and Klamath Tribal Health and Family Services.

1.03 DESCRIPTION OF ALTERATIONS WORK

A. Owner will remove the following items before start of work:
   1. Existing FFE and fitness equipment in existing rooms that are part of the scope of work..

1.04 WORK BY OWNER

A. Owner will supply the following for installation by Contractor:
   1. All Furnishings, Furniture and movable equipmnet..
   2. Exercise Equipment, Sauna, Cold Plunge, weights, red light therapy, tables..
   3. Kitchen Appliances, Teaching kitchen training mirror, ice machine, commercial style diswasher, Cooler and Freezers, range, exhaust hoods, etc. .
   4. Plateware, silverware, glassware, cooking vessels, etc..
   5. POS sales system in Smoothie Cafe.
   6. Medical and Dental Equipment.
   7. Artwork or wall mounted equipment.
   8. Health assessment equipment - Scales, desks, medical supplies
   9. If an item isnt attached to the structure, the Ownr is providing, unless noted otherwise.

1.05 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.Maintain exits from the existing facility.

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

1.06 CONTRACTOR USE OF SITE AND PREMISES

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

B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Work by Others.
   3. Work by Owner.

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

D. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the site is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   3. Prevent accidental disruption of utility services to other facilities.

1.07 WORK SEQUENCE

A. Coordinate construction schedule and operations with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 011000

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

1.02 SCHEDULE OF VALUES

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

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

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

D. Submit Schedule of Values electronically within 15 days after date of Owner-Contractor Agreement.

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

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 Owner for approval.

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

E. Execute certification by signature of authorized officer.

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

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

H. Submit <> electronic copies of each Application for Payment.

I. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 013000.
   2. Partial release of liens from major subcontractors and vendors.
   3. Affidavits attesting to off-site stored products.

J. When Owner requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.04 MODIFICATION PROCEDURES

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

B. For other required changes, Owner 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, Owner 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 10 working days.

D. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Owner 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 Owner.
   3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.

E. 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.
      e. Credit for deletions from Contract, similarly documented.
   2. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

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

G. 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.

H. 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.

I. Promptly enter changes in Project Record Documents.

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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 012000

SECTION 012500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

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

1.03 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to 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. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

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

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

E. Limit each request to a single proposed substitution item.
   1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. 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.

B. Submittal Form (before award of contract):
   1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. 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 Owner in order to stay on approved project schedule.

B. 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 Owner, 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:

C. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Owner 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, Ownerural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 CLOSEOUT ACTIVITIES

A. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION 012500

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Web-based project software service.

C. Preconstruction meeting.

D. Site mobilization meeting.

E. Progress meetings.

F. Construction progress schedule.

G. Contractor's daily reports.

H. Coordination drawings.

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

J. Number of copies of submittals.

K. Requests for Interpretation (RFI) procedures.

L. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: General product requirements.

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

C. Section 019113 - General Commissioning Requirements: Additional procedures for submittals relating to commissioning.

1. Where submittals are not indicated to be reviewed by Architect, submit directly to the Commissioning Provider (CxP); otherwise, the procedures specified in this section apply to commissioning submittals.

1.03 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 Owner and/or 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. Applications for payment and change order requests.
7. Progress schedules.
8. Coordination drawings.
9. Correction Punch List and Final Correction Punch List for Substantial Completion.
10. Closeout submittals.

1.04 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

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

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
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. Contractor and Architect are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor with no costs passed onto the Owner.

C. Submittal Service: The selected service is:
   1. Newforma ConstructEx: www.newforma.com/our-solutions/constructex/#sle.
   2. ProCORE.
   3. Any additional nationally recognized 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.

E. Schedule meeting after Notice of Award.

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

G. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.

H. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
   1. Special consultants.
   2. Major subcontractors.
   3. Review of RFIs log and status of responses.

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

J. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.

K. General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
   1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
      a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
      b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
      c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
      d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
      e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
      f. Indicate required installation sequences.
      g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

3.02 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:

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

B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Prepare PDF using software provided by the Electronic Document Submittal Service.
   3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
   2. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   3. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

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

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

F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.
   4. RFI description.

G. Review Time: Owner or Architect will respond and return RFIs to Contractor within Ten calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 1:00 PM will be considered as having been received on the following regular working day.
   1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
   1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
   2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
   3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
   4. Notify Architect in writing within 4 calendar days if the RFI response warrents change in the Contract Time or the Contract Sum.

3.03 SUBMITTAL SCHEDULE

A. Submit to Owner for review a schedule for submittals in tabular format.
   1. Format schedule to allow tracking of status of submittals throughout duration of construction.
   2. Arrange information to include scheduled date for initial submittal, specification number and title, and description of item of work covered.
   3. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.
      b. Number of samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal to Construction Manager with options selected.
      c. Number of Samples: submit three sets of samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a Project record sample.
         1) Submit a single sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
         2) If variation in color, patter, texture, or other characteristic is inherent in material or product represented by a sample, submit at least three sets of paired units that show approximate limits of variations.

B. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following in tabular form:
   1. Type of product. Include unique identifier for each product indicated in the Contract Documents.
   2. Manufacturer and product name, and model number if applicable.
   3. Number and name of room or space.
   4. Location within room or space.
   5. Submit product schdule in PDF format.

C. Coordination: Coordinate preparation and processing of submittals with performance of construciton activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule. Partial submittals will be rejected for re-submittal.

3. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
4. Manufacturer's catalog cuts.
5. Manufacturer's product specifications.
6. Standard color charts.
7. Statement of compliance with specified referenced standards.
8. Notation of coordination requirements.
9. Availability and delivery time information.
10. Other types indicated.

3.04 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.

3.05 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a single transmittal for related items.
2. Transmit using approved form.
    a. Use Contractor's form, subject to prior approval by Owner and Architect.
3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
    a. File name shall include specification division and title (i.e. 081416-1 - flush wood doors.pdf)
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. Options: Identify options requiring selection by the Architect on the Cover Sheet.
6. Deviations: Identify deviations from the Contract Documents on submittals on Cover Sheet.
7. When revised for resubmission, identify all changes made since previous submission.
8. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
9. Submittals not requested will be recognized, and will be returned "Not Reviewed",

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

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

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

3.06 SUBMITTAL REVIEW

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

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals in required. Architect will advise Construction Manager when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal in necessay, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 15 days for review of each resubmittal.
   4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, U.S. Forest Service, or other parties is indicated, allow 21 days for initial review of each submittal.

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

D. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
   1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

E. 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.
   2. Not Authorizing fabrication, delivery, and installation:
      a. "Revise and Resubmit".
         1) Resubmit revised item, with review notations acknowledged and incorporated.
      b. "Rejected".
         1) Submit item complying with requirements of Contract Documents.

F. 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 013000

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

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

C. Submit updated schedule with each Application for Payment.

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.

B. Diagram Sheet Size: Maximum 22 x 17 inches (560 x 432 mm).

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. Identify work of separate stages and other logically grouped activities.

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

E. Indicate delivery dates for owner-furnished products.

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

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

3.05 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 013216

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SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Control of installation.

F. Mock-ups.

G. Tolerances.

H. Manufacturers' field services.

I. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Document 007200 - General Conditions: Inspections and approvals required by public authorities.

B. Section 012100 - Allowances: Allowance for payment of testing services.

C. Section 013000 - Administrative Requirements: Submittal procedures.

1.03 REFERENCE STANDARDS

A. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2026.

B. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing of Soil and Rock as Used in Engineering Design and Construction; 2026.

C. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2026.

1.04 DEFINITIONS

A. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 SUBMITTALS

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

B. Test Reports: After each test/inspection, promptly submit two copies or PDF of report to Owner and Architect and to Contractor.

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

2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.

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

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

E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.

1.06 QUALITY ASSURANCE

1.07 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ services of an independent testing agency to perform certain specified testing and inspection; payment for cost of services will be derived from allowance specified in Section 012100; see Section 012100 and applicable sections for description of services included in allowance.

B. Where quality-control services are indicated as Owner's responsibility, Owner will employ and pay for services of an independent testing agency to perform other specified testing and inspection.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and ispecting they are engaaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

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

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. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Notify Architect and <> Consultant fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

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

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

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

G. 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 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

2.04 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.

B. 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.

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

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   3. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.

b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide 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.

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

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

2.05 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, and service connections 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.

2.06 DEFECT ASSESSMENT

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

END OF SECTION 014000

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

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

E. Vehicular access and parking.

F. Waste removal facilities and services.

G. Field offices.

1.02 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:
   1. Windows-based personal computer dedicated to project telecommunications, with necessary software and laser printer.
   2. Email: Account/address reserved for project use.

1.03 TEMPORARY SANITARY FACILITIES

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

B. New permanent facilities may not be used during construction operations.

C. Maintain daily in clean and sanitary condition.

1.04 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. Provide protection for plants designated to remain. Replace damaged plants.

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

1.05 FENCING

A. Construction: Contractor's option.

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

1.06 VEHICULAR ACCESS AND PARKING

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

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

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

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

E. Existing parking areas may not be used for construction parking.

1.07 WASTE REMOVAL

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

B. Provide containers with lids. Remove trash from site periodically.

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

D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.08 FIELD OFFICES

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

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

C. Locate offices a minimum distance of 30 feet (10 m) from existing and new structures.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015000

SECTION 015100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 015000 - Temporary Facilities and Controls:

1.03 REFERENCE STANDARDS

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

1.04 TEMPORARY ELECTRICITY

A. Cost: By Contractor.

B. Provide power service required from utility source.

C. Complement existing power service capacity and characteristics as required.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

E. Provide main service disconnect and over-current protection at convenient location and meter.

F. Permanent convenience receptacles may not be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED 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.

1.06 TEMPORARY HEATING

A. Cost of Energy: By Contractor.

B. Provide 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, unless indicated otherwise in specifications.

D. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY COOLING

A. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

B. Maintain maximum ambient temperature of 80 degrees F (26 degrees C) in areas where construction is in progress, unless indicated otherwise in specifications.

1.08 TEMPORARY VENTILATION

A. Existing ventilation equipment may not be used.

1.09 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Contractor.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 015100

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

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

B. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

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

1.02 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 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:

C. Where other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 016116.
   2. If wet-applied, have lower VOC content, as defined in Section 016116.

2.02 PRODUCT OPTIONS

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

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

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

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 012500 - Substitution Procedures.

3.02 TRANSPORTATION AND HANDLING

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

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

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

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

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

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

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

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

3.03 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 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 016000

SECTION 016116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 013000 - Administrative Requirements: Submittal procedures.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

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

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

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

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

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
   1. Concrete.
   2. Clay brick.
   3. Metals that are plated, anodized, or powder-coated.
   4. Glass.
   5. Ceramics.
   6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

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

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2025.

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

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

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

1.05 SUBMITTALS

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

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

1.06 QUALITY ASSURANCE

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

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

PART 2 PRODUCTS

2.01 MATERIALS

A. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

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

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

END OF SECTION 016116

SECTION 017000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Cutting and patching.

C. Surveying for laying out the work.

D. Cleaning and protection.

E. Starting of systems and equipment.

F. Demonstration and instruction of Owner personnel.

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

H. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

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

B. Section 014000 - Quality Requirements: Testing and inspection procedures.

C. Section 015100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

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

1.03 SUBMITTALS

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

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. 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.

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

1.04 QUALIFICATIONS

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

1.05 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

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

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

D. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

E. 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 LAYING OUT THE WORK

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

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Control datum for survey is that indicated on drawings.

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

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

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

H. Utilize recognized engineering survey practices.

I. 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.

J. Periodically verify layouts by same means.

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

3.04 GENERAL INSTALLATION REQUIREMENTS

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

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

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

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

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

3.05 CUTTING AND PATCHING

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

B. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.

7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

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

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

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

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

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

H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 078400, to full thickness of the penetrated element.

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

3.06 PROGRESS CLEANING

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

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

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

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

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

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

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

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

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

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

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

3.08 SYSTEM STARTUP

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

B. Notify Architect and Owner seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative and commissioning agent in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.09 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.10 ADJUSTING

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

B. Testing, adjusting, and balancing HVAC systems: See Section 230593 - Testing, Adjusting, and Balancing for HVAC.

3.11 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Use cleaning materials that are nonhazardous.

C. 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.

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

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

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, area drains, and drainage systems.

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

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

3.12 CLOSEOUT PROCEDURES

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

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

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

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

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

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

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

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

3.13 MAINTENANCE

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

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

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

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

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

END OF SECTION 017000

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. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.

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

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

1.03 SUBMITTALS

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

B. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Owner or Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Owner or Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit one set and one digital flash drive 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. Addenda.
   3. Change Orders and other modifications to the Contract.
   4. Reviewed shop drawings, product data, and samples.
   5. 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. Record Drawingsand Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   2. Field changes of dimension and detail.
   3. Details not on original Contract drawings.

2.02 OPERATION AND MAINTENANCE DATA

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

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

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

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

2.03 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

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

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

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

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

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

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

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

I. Include sequence of operation by controls manufacturer.

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

K. Include test and balancing reports.

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

2.04 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

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

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Provide one flash drive with PDF electric file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Owner and Architect.
   1. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.

D. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

E. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

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

G. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

H. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

I. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

J. Arrangement of Contents: Organize each volume in parts as follows:
   1. Project Directory.
   2. Table of Contents, of all volumes, and of this volume.
   3. Operation and Maintenance Data: Arranged by system, then by product category.
      a. Source data.
      b. Product data, shop drawings, and other submittals.
      c. Operation and maintenance data.
      d. Field quality control data.
      e. Photocopies of warranties and bonds.

2.05 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 017800

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GEOTECHNICAL EXPLORATION REPORT
BEATTY COMMUNITY CENTER
24110 GODOWA SPRINGS ROAD
BEATTY, OREGON



August 4, 2026

Wallace Group Project No. 26123 (2)

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ONLY STEELE ARCHITECTS, KLAMATH TRIBAL HEATH, AND THEIR DESIGNATED REPRESENTATIVES MAY USE THIS DOCUMENT AND ONLY FOR THE SPECIFIC PROJECT FOR WHICH THIS REPORT WAS PREPARED.

A Report Prepared For:

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GEOTECHNICAL EXPLORATION REPORT
BEATTY COMMUNITY HEALTH
24110 GODOWA SPRINGS ROAD
BEATTY, OREGON

Wallace Group Project Number 26123 (2)

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EXECUTIVE SUMMARY

The Wallace Group, Inc., (Wallace Group) completed a geotechnical engineering exploration for the proposed Beatty Community Center project, located at 24110 Godowa Springs Road in Beatty, Oregon (**Figure 1**, *Vicinity Map*). A figure with exploration locations is shown on **Figure 2**, *Exploration Location Map*.

Based on discussions with Steele Architects (Client), and review of preliminary architectural site plans by Steele, dated June 1, 2026, we understand that a new Community Center is proposed. We anticipate the structure will be single-story and will have a footprint of approximately 3,800 square feet (sf). The facility will be used to provide medical and dental treatment and will have conference rooms and a fitness room. We anticipate the structure will have shallow cast-in-place concrete footings and be timber-framed. Additional improvements will include underground utility construction, vehicular parking facilities, and landscaping.

Subsurface explorations generally encountered silty-sand, underlain by sand. The silty-sand was loose to medium dense and extended from the surface to a depth of approximately 2.5-feet below ground surface (bgs). Below the silty-sand, medium dense to very dense well-graded-sand was encountered that extended the full depth of the exploration of approximately 28.8-feet. The well-graded-sand was slightly cemented and caused refusal with the geoprobe at a depth of approximately 12.5-feet bgs. Groundwater was encountered in the CPT at a depth of approximately 13.5-feet bgs.

Based on this exploration, the site appears suitable for the expected development from a geotechnical perspective, provided the recommendations contained in this report are incorporated into design and construction.

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1.0 INTRODUCTION

1.1 GENERAL

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1.2 PROJECT DESCRIPTION

Based on discussions with Steele Architects (Client), and review of preliminary architectural site plans by Steele, dated June 1, 2026, we understand that a new Community Center is proposed. We anticipate the structure will be single-story and will have a footprint of approximately 3,800 square feet (sf). The facility will be used to provide medical and dental treatment and will have conference rooms and a fitness room. We anticipate the structure will have shallow cast-in-place concrete footings and be timber-framed. Additional improvements will include underground utility construction, vehicular parking facilities, and landscaping.

1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this exploration was to evaluate general subsurface conditions within the proposed development area to provide recommendations for foundations, earthwork considerations, site preparation, and other geotechnical aspects related to site development. The scope of services included the following tasks:

- Review regional and project area geology;
- Explore subsurface conditions with cone penetration and geoprobe testing;
- Perform engineering evaluations for the feasibility of geotechnical-related aspects of development; and
- Prepare this geotechnical report summarizing our findings, conclusions, and recommendations.

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2.0 FIELD EXPLORATION

2.1 SUBSURFACE EXPLORATION

Subsurface conditions were explored on July 6, 2026. One cone penetration test (CPT) (designated CPT-1) and one geoprobe test (designated GP-01) were advanced to depths ranging from approximately 12.5- to 28.8-feet below ground surface (bgs). The geoprobe and CPT were advanced by Oregon Geotechnical Explorations (OGE) of Salem, Oregon. A Wallace Group geotechnical professional logged the geoprobes, collected representative samples, and visually classified the materials encountered. The CPT log, located in **Appendix A**, describes the materials encountered at each location explored. The soil and bedrock types between explorations are anticipated to be similar; however, variation should be expected. The stratigraphic contacts indicated at each point of exploration represent the approximate boundaries between soil and bedrock types. The approximate locations of the CPT and geoprobe are shown on **Figure 2**.

A more complete description of the sampling techniques and soil-classification terminology is presented in **Appendix A**.

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3.0 LABORATORY TESTING

Soil samples were transported to our Bend geotechnical laboratory where they were visually classified and prepared for laboratory analyses. Soil classification is based on the 'finer fraction' consisting of particles that are 3-inch diameter or less. Laboratory tests were conducted in general accordance with standard procedures and included the following:

- Moisture Content, ASTM D2216;
- Gradation Analyses, ASTM C117 / C136; and
- Classification of Soil for Engineering Purposes, ASTM D2487.

Laboratory test results are included in **Appendix B**.

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4.0 EXISTING SITE CONDITIONS

4.1 SURFACE

The existing site is substantially undeveloped, with the exception of a possible septic leach field. The site is relatively level with site grades that slope down to the east. The site does not support trees or shrubs but does support some high desert rangeland grasses.

4.2 SUBSURFACE CONDITIONS

Subsurface explorations generally encountered silty-sand, underlain by sand. The loose to medium dense silty-sand extended from the surface to a depth of approximately 2.5-feet below ground surface (bgs). Below the silty-sand, well-graded-sand was encountered that extended the full depth of the exploration of approximately 28.8-feet. The sand was slightly cemented and medium dense to very dense. The very dense sand caused refusal with the geoprobe at a depth of approximately 12.5-feet bgs. Groundwater was encountered in the CPT probe at a depth of approximately 13.5-feet bgs.

4.2.1 Silty-Sand

Native, silty-sand was encountered in CPT-1/GP-01 extending from the surface to a depth of approximately 2.5-feet bgs. A gradation test indicated the native soil generally classifies as silty-sand (SM), according to the Unified Soil Classification System (USCS). Where tested, the native silty-sand soil sample contained 15 percent clay- and silt-sized particles, had a moisture content of 19.6 percent. The silty-sand was slightly moist, brown, and coarse to fine-grained. Based on CPT testing, the native silty-sand was generally loose to medium dense.

4.2.2 Well-Graded-Sand

Below the silty-sand, the explorations encountered well-graded-sand. Laboratory testing indicates the sand generally classifies as well-graded-sand-with-silt (SW-SM), according to the USCS. Where tested, the native sand contained 5 percent clay- and silt-sized particles and had a moisture content of 46.6 percent. The sand was slightly moist to wet, brown to gray, and coarse- to fine-grained. Based on CPT testing, the sand-with-silt was generally medium dense to very dense. The sand was also slightly cemented and caused refusal with the geoprobe at a depth of approximately 12.5-feet bgs. The soil extended to the full depth of the CPT exploration of 28.8-feet bgs.

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4.3 GROUNDWATER

Groundwater was encountered in the CPT exploration, and groundwater was measured using pore pressure dissipation testing. Based on the pore pressure dissipation testing, groundwater depth was approximately 13.5-feet bgs.

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5.0 REGIONAL GEOLOGY AND SEISMIC CONSIDERATIONS

5.1 REGIONAL AND SITE GEOLOGY

The subject site is located in the basin and range geologic province of south-central Oregon. Typical bedrock in the project vicinity consists of Miocene and Pliocene era basalt, andesite, rhyolite, and some sedimentary rock. Localized finger deposits of continental fluvio-lacustrine (rivers and lakes) coalesce with the region's igneous bedrock. Near surface deposits consist of alluvial fan and talus deposits of the Pleistocene era. The surface deposits are typically poorly to well sorted sand and gravel. Below the surface deposits, the area is mapped as underlain by Pliocene and Miocene era continental sedimentary rocks. The continental sedimentary rocks consist of thinly bedded to very thick beds of ashy diatomite, thin to medium bedded sandstone, siltstone, and laminated mudstones which have been deposited in a series of freshwater lakes and deltas (Sherrod, 1992).

5.2 REGIONAL SEISMICITY

There are two primary earthquake source types that have been identified in the Pacific Northwest region: Cascadia Subduction Zone sources and shallow crustal sources. These sources result in three earthquake source classifications: (1) shallow crustal earthquakes, (2) deep earthquakes with a moment magnitude greater than 7.0 on the seismogenic part of the subducting plate of the Cascadia Subduction Zone, and (3) an earthquake with a possible moment magnitude of 9.0 (+/- 0.2) on the seismogenic part of the interface between the Juan de Fuca Plate and the North American Plate on the Cascadia Subduction Zone. Historic seismic activity in the Klamath Falls area has been primarily from shallow crustal sources. This crustal activity has occurred in a diffuse pattern and does not appear to be aligned with known, active fault features.

Geomatrix prepared a report for the Oregon Department of Transportation (ODOT) on the seismic hazards in Oregon. Included in the report is a map of Quaternary Faults in Oregon. The ODOT Report identified one, northwest trending fault that displaces Undifferentiated Quaternary deposits in the project vicinity. The Modoc Plateau faults are located approximately 10 miles southwest of the site. The Modoc Plateau faults are generally characterized as "inactive," with the most recent movement at least 1.6 million years ago. Faults are considered active if displacement is observed within the Holocene period (within the last 10,000 years). Based on our understanding of the geology in the project vicinity, geologic hazards beyond those typical for south-central Oregon are not present at the project site.

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5.3 SEISMIC HAZARDS

Beatty is in an area of low to moderate seismic risk. The 2025 Oregon Structural Specialty Code (OSSC), based on the 2024 International Building Code (IBC), requires that the development be designed to sustain the maximum risk-based earthquake. Based on subsurface exploration at the project site and CPT shear wave velocity testing within the upper 28-feet, the geometric mean shear wave velocity is 1,414 feet per second. The applicable seismic site class is defined as “Dense Sand or Very Stiff Clay”. Therefore, the ASCE 7-22 Seismic Site Class CD should be used for structural design.

Using the data collected from CPT and laboratory testing, the potential for seismically induced liquefaction to develop within the profile was evaluated using the procedure outlined by Seed and Idriss (1971). The procedure uses CPT tip resistance, friction ratio, and other soil data to estimate the cyclic resistance ratio (CRR) profile with depth (ratio of the cyclic shear stress required to cause liquefaction to the initial vertical effective stress). The cyclic stress ratio (CSR) profile with depth (ratio of cyclic shear stress to initial vertical effective stress) resulting from the design level earthquake is estimated from the total and effective stresses, the peak ground surface acceleration value, the magnitude of the design level earthquake, and a depth dependent stress reduction factor.

Based on the results of the geotechnical exploration, and very dense sand encountered below groundwater, the potential for seismic-induced liquefaction is negligible.

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6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of field exploration, laboratory testing, engineering analyses, and our local experience, it is our opinion that the site is suitable for the anticipated development from a geotechnical perspective.

6.1 EXCAVATIONS AND GRADING

Preliminary grading plans were not available at the time this report was prepared; however, based on our discussions with the project team, we anticipate cuts and fills will generally be less than a few feet. For excavations performed for utility or foundation construction, the native silty-sand soil can generally be excavated with conventional earth-moving equipment such as excavators and small dozers. With depth, we anticipate the excavations will encounter more dense materials and toothed excavation equipment will be required.

Excavations made in native soil should be classified as "Type C" material for Occupational Safety and Health Administration (OSHA) excavation purposes. If sloping excavations are used in the soil, the temporary slopes should not be steeper than 1.5 to 1, horizontal to vertical (H to V). Permanent slopes should be at grades no steeper than 2 to 1 (H to V).

6.1.1 Site Preparation

We recommend that the development areas are stripped of all vegetation and organic soil to expose native silty-sand soil. The development area should be considered within improvement footprints and extending five feet beyond the perimeter of building pads, driveways, sidewalks, parking areas, and roadways.

Once the organic soil and roots are removed, the subgrade should be moisture-conditioned and compacted with suitable compaction equipment. Undocumented fill was not encountered during the exploration and should be removed from development areas if it is encountered during construction. After removal of unsuitable materials and compaction as noted above, the subgrade in the development areas should be proof-rolled with a loaded 10-cubic-yard-dump truck, or full 4,000-gallon water truck, to confirm subgrade stability prior to placing new fill. Any deflection observed during proof-rolls should be addressed. If unstable ("pumping") soil is observed in isolated areas, remedial measures may consist of further compaction, including moisture-conditioning (aeration), or over-excavation and replacement with granular, structural fill. Pumping-soil conditions are more common when site preparation occurs during spring and after periods of prolonged precipitation. Wallace Group should be consulted to confirm

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stripping depths, undocumented fill removal, and observe proof-rolls and subgrade-bearing conditions prior to placing new structural fill or concrete forms.

6.1.2 Structural Fill Materials and Placement

Where structural fill is needed to raise grades beneath load-bearing elements, such as floor slabs and footings, we recommend it consist of appropriately graded sand and gravel having 100 percent passing a two-inch sieve, less than 30 percent retained on the ¾-inch sieve, and less than 20 percent passing a No. 200 sieve. On-site, non-organic, native soil should be suitable for reuse as structural fill provided it meets the specifications below in **Table 6.1.2**. We recommend structural fill have a maximum dry density (ASTM D1557) of at least 90 pounds per cubic foot (pcf).

In addition, we recommend:

- Structural fill be moisture-conditioned to within a range of +/- 2 percent of optimum moisture content, placed in 8-inch level, loose lifts, and compacted as recommended in **Table 6.1.2**, *Engineered Fill Specifications Summary.*
- Structural fill should not be placed during freezing weather or on frozen subgrade to avoid potential thaw settlement.
- Wallace Group periodically observe the fill placement and test the fill for grain-size and compaction.

Foundation backfill should consist of compacted structural fill to reduce moisture infiltration below proposed developments.

Table 6.1.2, below, summarizes the placement and compaction specifications for anticipated uses of structural fill for this project.

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Table 6.1.2
Engineered Fill Specifications Summary
Beatty Community Center
Beatty, Oregon

Material Type & Specifications	Placement Location	Placement Specifications
Base Course – Crushed Aggregate, ¾-inch minus, <8% passing #200 sieve.	Base Course Beneath Slabs on Grade, Pavement, and Footings	Maximum 6" lifts; compacted to minimum 95% of modified Proctor density (ASTM D1557) for floor slabs, footings, 92% for pavement, exterior slabs and sidewalks.
Structural Fill - Granular, Inorganic soil, 2-inch minus, <30% retained on ¾-inch sieve, <20% passing #200 sieve. Non-plastic. Maximum dry density of at least 90 pcf.	Beneath Slabs on Grade, Exterior Slabs, Pavement, Sidewalks, Footings, and Footing Backfill	Maximum 8" lifts; compacted to minimum 95% of modified Proctor density (ASTM D1557) for floor slabs, footings, all fill exceeding 5 feet vertical, 92% for pavement, exterior slabs and sidewalks.
Utility Trench and General Backfill – 2-inch minus sand & gravel, <20% passing the No. 200 sieve, or on-site soil materials.	Utility Trench Backfill	Maximum 8" lifts; compacted to minimum 95% of modified Proctor density (ASTM D1557) beneath footings, floor slabs, 92% for exterior pavement and sidewalks, 90% in non-structural areas.
Granular Landscape Fill – Inorganic soil, 3-inch minus.	Landscaped Areas	Fill depth less than 4 feet, compaction not required. Fill depths greater than 4 feet, compact to a minimum of 85% of modified Proctor (ASTM D1557).

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6.2 FOUNDATION DESIGN

We recommend the proposed Community Center is supported on shallow spread and continuous footings, bearing on native soil and new structural fill. We recommend footings bearing on properly compacted native soil and structural fill should be designed for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf). Soil exposed in the bottom of footing excavations should be moisture conditioned and compacted with suitable equipment and evaluated by Wallace Group.

The following criteria should also be incorporated into project plans and specifications:

- Exterior footings should bear below frost depth of 24 inches.
- Continuous strip footings should be at least 18 inches wide. Isolated pad footings should be at least 24 inches square.
- Footings bearing on properly compacted native soil, structural fill, and ABC should experience total and differential settlement less than ¾-inch.
- The allowable bearing pressure can be increased by 1/3 for temporary loads such as wind and seismic.
- Structural fill and ABC placed beneath footings should be compacted to at least 95 percent of modified Proctor density, ASTM D1557.
- Placement and compaction of structural fill should be observed and/or tested by a Wallace Group technician working under the direction of a professional engineer.
- The allowable coefficient of sliding resistance between the concrete and soil is 0.3. This value includes a factor of safety equal to 1.5.
- If friction resistance is used for design, we recommend using a factor of safety against sliding of 1.5. If passive resistance is also included in sliding resistance, we recommend factor of safety of 2.

6.3 FLOOR SYSTEMS AND EXTERIOR FLATWORK

Structures, which are constructed with slab-on-grade flooring, will be underlain by new structural fill below slab. The compacted and density-tested structural fill will provide adequate support for the floor slab provided the subgrade is prepared in accordance with **Section 6.1.1** – *Site Preparation*. We recommend a minimum of 6 inches of crushed ABC be placed beneath the interior slab-on-grade. The base course should comply with the specifications shown in **Table 6.1.2**, *Engineered Fill Specifications Summary,* and be compacted to at least 95 percent of ASTM D1557. If more than six inches of material is needed to establish bottom-of-slab level, either

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additional base course or structural fill, compacted to a minimum of 95 percent of ASTM D1557, can be used to raise the subgrade elevation.

For slab and footing design, we recommend a unit modulus of subgrade reaction (K_{v1}) of 125 pounds per cubic inch (pci). This is a unit value for a 1-foot square. The modulus should be reduced in accordance with the following equation based on the foundation or slab width, 'B.'

$$K_v = K_{v1} [(B+1)/(2B)]^2$$

where: K_v = modulus of subgrade reaction (pci)
K_{v1} = unit subgrade modulus (pci)
B = foundation width (feet)

We recommend that a vapor barrier is used under the concrete slab-on-grade in accordance with the 2025 Oregon Structural Specialty Code (OSSC). Even with a capillary break or vapor barrier, there is the possibility some floor moisture or dampness may occur because of inadequate perimeter drainage or other unforeseen conditions (i.e., plumbing leaks and broken waterlines). These post-construction conditions should be addressed separately by qualified specialists with local knowledge of slab moisture protection systems, flooring design, and other components that may be influenced by moisture intrusion. Our report addresses present subgrade conditions for slab support only and does not evaluate future, potential moisture conditions.

Light-duty concrete flatwork, such as sidewalks, should be underlain by a minimum of 4 inches of crushed aggregate leveling course compacted to at least 95 percent of ASTM D1557. Structural fill beneath light duty exterior slabs and sidewalks should be placed in lifts not exceeding eight-inches thick. All organic material, including roots larger than ½-inch in diameter, and other deleterious material exposed at slab or sidewalk subgrade elevations should be removed to firm, unyielding native soil and replaced with structural fill.

The native soil has moderate frost heave potential in the present moisture condition. However, if a source of moisture becomes present, the soil will exhibit some frost heave. Exterior slabs could heave on the order of ¾-inch if the silty-sand subgrade soil is saturated and sub-freezing temperatures occur. Exterior slabs should be depressed from doorway thresholds ¾-inch to accommodate frost heave. The most effective and economical method to control frost heave is

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provision for adequate drainage of surface runoff away from slabs and other foundation elements.

6.4 LATERAL EARTH PRESSURES

Based on existing site grades, earth retaining walls may be required for site development. Lateral pressures on earth-retaining walls depend upon the type of wall, hydrostatic pressure behind the wall, type of backfill material and compaction method, and allowable wall movement. Where allowable wall movement is less than 1/2-percent of the wall height or where wall movement is constrained, lateral earth pressures should be estimated for an "at rest" condition. Where allowable wall movement is greater than 1/2-percent of the wall height, lateral earth pressures may be estimated for an "active" condition. In general, walls that are attached to a structure or braced should be designed for the "at-rest" condition, and unattached, un-braced walls may be designed for the "active" condition. Where walls are backfilled and compacted, the compaction effort can induce somewhat higher lateral earth pressures than "at rest." Backfill compaction within five feet of the wall face should be conducted with manually operated "jumping jack" and vibratory plate compactors to reduce the potential for high, lateral earth pressures.

Sliding potential exists between the concrete foundation and the underlying soil. The allowable coefficient of friction between the concrete and underlying soil is 0.3, this value includes a factor of safety equal to 1.5. Sliding friction can be increased by 1/3 for temporary loads, such as wind and seismic. All lateral loads on retaining walls should be resisted by friction only, where possible, because of the relatively large deformations required to mobilize full passive earth pressure.

Retaining walls backfilled and compacted with structural fill should be designed for an equivalent fluid lateral earth pressure of 55 pounds per cubic foot (pcf) for "at-rest" conditions. If earth retaining walls are free to rotate at the top, an active earth pressure of 35 pcf should be used for design. These lateral pressures are for level backfill and do not include surcharge loads or hydrostatic pressure. For seismic design, an additional triangular pressure distribution of 20 pcf should be included in design.

Retaining walls should be constructed with back drains or designed for hydrostatic pressure. If used, back-drains should be installed that are routed to a suitable stormwater outlet. The back-drains should have a minimum uniform slope of 1/16-inch per foot and extend to a suitable gravity drainage disposal location. The drainpipe should consist of rigid four-inch diameter

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perforated PVC pipe placed in a bedding of, and surrounded by, standard ¾-inch to 2½-inch, washed drain rock. The annular thickness of drain rock around the pipe should be at least four inches. Drain rock should extend up the back of the wall and be at least 12-inches wide. Alternatively, a drainage blanket can be used in lieu of the drain rock along the back of the wall. The drain rock should be encased in filter fabric to reduce the potential for migration of fine soil particles into and clogging the pipe. To prevent water migration into the new structure, below-grade walls should be waterproofed and joints and penetrations should be sealed. Clean outs should be constructed to access potential pipe blockages.

Any additional lateral earth pressures from surcharges or slopes need to be adequately resisted. Wallace Group should provide supplemental recommendations if surcharge loading will be present within a lateral distance equal to the height of the wall or if nearby slopes are present.

6.5 DRAINAGE CONSIDERATIONS

Foundation and roadway performance is influenced by drainage conditions around the perimeter of the proposed structure. Adequate drainage should be provided and maintained throughout the life of improvements and water must not be allowed to infiltrate below the foundation. We recommend the ground surface is sloped to drain surface water away from the improvements without ponding. On proposed structures, gutters and downspouts should be installed to collect and discharge roof drainage away from the foundation. The ground surface adjacent to foundations should be sloped away from foundations at least 5 percent in landscaped areas and 2 percent in hard-surfaced areas. We anticipate stormwater will be collected and discharged into on-site drainage swales and drywells.

6.6 PAVEMENT RECOMMENDATIONS

6.6.1 Parking Areas and Access Drives

We anticipate that traffic will likely consist of light automotive, and occasional service vehicles. Traffic during construction will consist of heavier vehicles with higher wheel loads and precautions should be taken to prevent damage to any newly constructed pavement.

The proof-rolled, inorganic-native-granular soil, and properly compacted new structural fill will provide, in our opinion, adequate subgrade support for asphalt-paved-parking areas within the proposed development. Proper roadway section drainage, including site drainage to avoid ponding of water adjacent to roadway areas, will aid in reducing the potential for pavement distress. Structural fill in paved areas should consist of processed on-site native soil or imported

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sand and gravel meeting the requirements of **Table 6.1.2**, *Engineered Fill Specifications Summary*. Roadway subgrade fill should be placed in maximum 8-inch-thick level lifts, loose thickness, moisture-conditioned, and compacted to at least 95 percent of ASTM D1557.

Based on the anticipated use of the Community Center facility, we recommend an asphalt section of 3-inches asphalt underlain by 6-inches of ABC. This pavement section recommendation represents the minimum thickness necessary to meet anticipated demands. The Client should anticipate that periodic preventative maintenance will be required to achieve lasting pavement performance. Preventative maintenance including crack sealing, surface sealing, and patching will likely be required to slow the rate of deterioration.

6.6.2 Pavement Material Specifications

The asphalt should be dense-graded, hot mix asphalt concrete (HMAC) as specified in ODOT Section 00745 plus the following supplemental specifications for density testing:

- HMAC mix design for private parking and access drives should be Level 2.
- ABC should be compacted to a minimum of 95 percent of standard Proctor (ASTM D1557).
- The asphalt binder should be PG 64-28, or as specified by the Civil Engineer.
- The ABC should be ¾-inch minus, dense graded aggregate as specified in ODOT Sections 00641 and 02630.10.
- Road-mixed ABC is permitted per Section 00641. Road-mixed ABC allows water to be added on-site for compaction vs. pug-milled materials processing.
- The HMAC should be compacted to a minimum of 92 percent of the Rice theoretical maximum density.

Supplemental Specifications for Density Testing: The roadway and parking AC and ABC should be field tested for in-place density.

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7.0 ADDITIONAL SERVICES

7.1 DESIGN AND CONSTRUCTION PERIOD ENGINEERING SERVICES

Wallace Group will review the geotechnical and civil aspects of the project design plans and specifications, when completed, to confirm that our recommendations are incorporated into the project documents, and to make appropriate modifications, if necessary. We currently anticipate performing design review of foundation, grading, and drainage plans to document that our recommendations are incorporated into design. This review will reduce misinterpretation of our recommendations and reduce the potential for costly design changes and construction delays.

7.2 CONSTRUCTION INSPECTION AND TESTING

To maintain our role as the geotechnical engineer of record, Wallace Group will also observe and monitor earthwork construction including site preparation, placement, and compaction of engineered fill in building pad area, utility trench backfill, foundation, and slab preparation. The purpose of these services will be to help document that site grading and development-area-subgrade preparation complies with the recommendations of this geotechnical report and the approved project plans and specifications. If subsurface conditions are encountered during construction that differ from the conditions described herein, we will review our recommendations considering these different conditions and recommend changes in design or construction procedures.

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8.0 LIMITATIONS

Exploratory CPT and geoprobe advanced for this study were placed to obtain an understanding of underground conditions for evaluation and design purposes. The exploration was performed using a mutually-agreed-upon scope of services. Variations from these conditions, not indicated by the CPT and geoprobe, are possible. These variations are sometimes enough to necessitate design modifications. Steele Architects (Client) and the project owner must recognize that it is impossible to predict every physical condition that will be encountered. If unexpected conditions are observed during construction, or if the size, type, elevation, or location of the proposed structure should differ significantly from the preliminary schematics, we should be notified to review the recommendations contained in this report. The professional judgments expressed in this report meet the standard of care of our profession; however, no warranty is expressed or implied.

This report may be used only by the Client and only for the intended site and for the purposes stated within a reasonable time from its issuance, but in no event, later than three (3) years from the date of the report. Land or facility use, on- and off-site conditions, regulations, or other factors may change over time, and additional work may be required with the passage of time. Any party other than the Client or their design team who wishes to use this report shall notify the Wallace Group of such intended use. Based on the intended use of the report, the Wallace Group may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the Client or anyone else will release Wallace Group from any liability resulting from the use of this report by any unauthorized party. The contractor selected for this project is responsible for supervision and direction of the actual work performed by their employees, subcontractors, and agents. Wallace Group will use accepted geotechnical engineering and testing procedures; however, our testing and observations will not relieve the contractor of their primary responsibility to produce a completed project conforming to the project plans and specifications.

This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for the safety of personnel other than our own on the site. The safety of others is the responsibility of the contractor. The contractor should notify the owner if they considers any of the recommended actions presented herein unsafe.

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9.0 REFERENCES

American Society of Civil Engineers, 2026, ASCE 7 Hazard Tool Website Data Base.

Geomatrix Consultants, 1995, Seismic Design Mapping State of Oregon: Final Report, prepared for Oregon Department of Transportation under personal services contract 11688.

Oregon Structural Specialty Code, 2025, based on the 2024 International Building Code.

Priest, G.R., et al, Geologic Map of the Klamath Falls Area, Klamath County, Oregon, 2007, Oregon Department of Geology and Mineral.

Sherrod, D.R. and Pickthorn, L.B.G., 1992, Geologic map of the west half of the Klamath Falls 1 degree by 2 degrees quadrangle, south-central Oregon, U.S. Geological Survey, Miscellaneous Investigations Series Map I-2182

U.S. Geological Survey, 2026, U.S. Geological Survey's Interactive Quaternary Faults Data Base.

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10.0 PROFESSIONAL AUTHENTICITY

This report has been authored and reviewed by the undersigned, respectively. This report is void if the original seal(s) and signature(s) are not included.



Digitally signed by Adam Larson
Date: 2026.08.04 16:12:15-07'00'

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FIGURES



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VICINITY MAP
BEATTY COMMUNITY CENTER
BEATTY, OREGON

PROJECT No:	26123 (2)
DRAWN:	July 21, 2025
DRAWN BY:	KAK
CHECKED BY:	LMS
FILE NAME:	26123 (2) Figure 1

FIGURE
1



LEGEND

CPT-1 & GP-01: CPT and Geoprobe No. and Location

N

APPROXIMATE SCALE
1" = 30'

NOTE: Exploration Locations are Approximate.

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NORTHWEST GEOSYSTEM EXPERTS

EXPLORATION LOCATION MAP
BEATTY COMMUNITY CENTER
BEATTY, OREGON

PROJECT No:	26123 (2)
DRAWN:	July 21, 2026
DRAWN BY:	KAK
CHECKED BY:	LMS
FILE NAME:	26123 (2) Figure 2

FIGURE: 2

WALLACE GROUP
NORTHWEST GEOSYSTEM EXPERTS

APPENDIX A

APPENDIX A
FIELD EXPLORATION SUMMARY

GENERAL

Subsurface conditions for the proposed Beatty Community Center, located at 24110 Godowa Springs Road in Beatty, Oregon were explored by advancing one (1) cone penetration test (CPT) (designated CPT-1) and one (1) Geoprobe boring (designated GP-01), at the location shown on **Figure 2**, *Exploration Location Map*. CPT and Geoprobe logs are included in this appendix. The exploration program was performed on July 6, 2026. The procedures used to advance the CPT, geoprobe, and collect soil samples and other field techniques are described in detail in this appendix. Unless otherwise noted, all soil sampling and classification procedures followed local engineering practices, which are in general conformance with relevant ASTM procedures and the Unified Soil Classification System (USCS). "General conformance" means that certain local and common exploration and descriptive practices and methodologies have been followed.

CONE PENETRATION TESTING

One CPT was advanced by Oregon Geotechnical Explorations of Salem, Oregon. The CPT was performed by hydraulically-pushing a 1.4-inch-diameter, cone-tipped probe, with a projected area of 10 square centimeters, into the ground. The cone tip measures tip resistance, and a sleeve behind the cone tip measures frictional resistance. Electrical strain gauges or load cells within the cone continuously measured cone tip resistance and frictional resistance during the entire depth of each probing. Accumulated data was processed to provide engineering information, such as the types and approximate strength characteristics of the soil encountered. The CPT was advanced to a depth of approximately 28.8-feet below ground surface (bgs).

One geoprobe was advanced adjacent to the CPT location to collect soil samples for laboratory testing and the locations are shown on Figure 2. The geoprobe was advanced by vibrating a 1.25-inch-diameter casing to a depth of approximately 12.5-feet bgs. CPT and GP holes were abandoned with bentonite.

MATERIAL DESCRIPTIONS

Soil samples were visually classified in the field as they were collected. Consistency, color, and other distinguishing characteristics of the samples were noted. Afterwards, the soil samples were re-examined in the laboratory and the field descriptions were modified where necessary. The terminology used in the soil descriptions are defined in the following sections.

GEOPROBE AND CPT LOGS

The geoprobe log is presented on Figure A-1 and the CPT log follows. The logs describe the materials encountered and the depths where materials and/or characteristics of these materials changed, although the changes may be gradual. Where material types and descriptions changed between samples, the contacts were interpreted. Where measured, shear wave velocities are shown on the logs.

GROUNDWATER

Groundwater was encountered during drilling activities at depths of approximately 13.5-feet bgs. We anticipate that the groundwater will deviate seasonally by as much as 3-feet. It is unlikely that groundwater will be encountered during site development.

TERMINOLOGY USED TO DESCRIBE SOIL AND ROCK

Soils exist in mixtures with varying proportions of components. The predominant soil, i.e., greater than 50 percent based upon total dry weight, is the primary soil type and is capitalized in our log descriptions, e.g., SAND, GRAVEL, SILT or CLAY. Lesser percentages of other constituents in the soil mixture are indicated by use of modifier words in general accordance with the Visual-Manual Procedure (ASTM D2488-93). "General Accordance" means that certain local and common descriptive practices have been followed. In accordance with ASTM D2488, group symbols (such as GP or CH) are applied on that portion of the soil passing the 3-inch (75mm) sieve based upon visual examination. The following describes the use of soil names and modifying terms used to describe fine- and coarse-grained soils.

Fine - Grained SOILS (More than 50% fines passing 0.074 mm, #200 sieve)

The primary soil type i.e. SILT or CLAY is designated through visual – manual procedures to evaluate soil toughness, dilatancy, dry strength, and plasticity. The following describes the terminology used to describe fine - grained soils and varies from ASTM 2488 terminology in the use of some common terms.

Primary soil NAME, adjective and symbols			**Plasticity Description**	**Plasticity Index (PI)**
SILT ML & MH	CLAY CL & CH	ORGANIC SILT & CLAY OL & OH		
SILT		Organic SILT	Non-plastic	0 - 3
SILT		Organic SILT	Low plasticity	4 - 10
Clayey SILT	Silty CLAY	Organic clayey SILT	Medium Plasticity	>10 – 20
Clayey SILT	CLAY	Organic silty CLAY	High Plasticity	>20 – 40
Clayey SILT	CLAY	Organic CLAY	Very Plastic	>40

Modifying terms describing secondary constituents, estimated to 5 percent increments, are applied as follows:

Description	**% Composition**
Trace sand, trace gravel	5% - 10%
With sand; with gravel	15% - 25%
Sandy, or gravelly	30% - 45%

Borderline Symbols, for example CH/MH, are used where soils are not distinctly in one category or where variable soil units contain more than one soil type. Dual Symbols, for example CL-ML, are used where two symbols are required in accordance with ASTM D2488.

Soil Consistency. Consistency terms are applied to fine-grained, plastic soils (i.e., PI > 4). Descriptive terms are based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586-84, as follows.

Consistency Term	SPT N-value	Unconfined Compressive Strength	
		Tons/sq.ft.	kPa
Very soft	Less than 2	Less than 0.25	Less than 24
Soft	2 - 4	0.25 - 0.5	24 - 48
Medium stiff	5 - 8	0.5 - 1.0	48 – 96
Stiff	9 - 15	1.0 - 2.0	96 – 192
Very stiff	16 - 30	2.0 - 4.0	192 – 383
Hard	Over 30	Over 4.0	Over 383

Note: For SILT with low to non-plastic behavior, (i.e., PI < 4) a relative density description is applied.

Coarse-Grained Soils (less than 50% fines)

Coarse-grained soil descriptions, i.e., SAND or GRAVEL, are based on that portion of materials passing a 3-inch (75mm) sieve. Coarse-grained soil group symbols are applied in accordance with ASTM D2488 based upon the degree of grading, or distribution of grain sizes of the soil. For example, well graded sand containing a wide range of grain sizes is designated SW; poorly graded gravel, GP, contains high percentages of only certain grain sizes. Terms applied to grain sizes follow.

	Particle Diameter	
	Inches	**Millimeters**
Sand (S)	0.003 - 0.19	0.075 - 4.8
Gravel (G)	0.19 - 3.0	4.8 - 75
	Additional Constituents	
Cobble	3.0 - 12	75 - 300
Boulder	12 - 120	300 - 3050
Rock Block	>120	>3050

The primary soil type is capitalized, and the amount of 'fines' in the soil are described as indicated by the following examples. Other soil mixtures will provide similar descriptive names.

Example: Coarse-Grained Soil Descriptions with Fines

5% fines	10% fines (Dual Symbols)	15% to 45% fines
GRAVEL with trace silt: GW or GP	GRAVEL with silt, GW-GM	Silty GRAVEL: GM
SAND with trace clay: SW or SP	SAND with clay, SP-SC	Silty SAND: SM

Additional descriptive terminology applied to coarse-grained soils follow.

Coarse-Grained Soil Containing Secondary Constituents

Clean	< 5% fines
With sand or with gravel	15% - 25% sand or gravel
Sandy or gravelly	30% - 45% sand or gravel
With cobbles; with boulders	Any amount cobbles or boulders. Additional terms may be used to describe amount including abundant, scattered.

Cobble and boulder deposits may include a description of the matrix soils, as defined above.

Relative Density terms are applied to granular, non-plastic soils based on direct measure or correlation to the Standard Penetration Test N-value as determined by ASTM D1586.

Relative Density Term	***SPT N-value***
Very loose	0 - 4
Loose	4 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	> 50

Terminology Used to Describe Rock

Scale of Rock Strength

Description	Designation	Unconfined Compressive Strength, psi	Unconfined Compressive Strength, MP	Field Identification
Very low strength	R1	100 – 1000	0.7 – 7	Crumbles under firm blows with point of geology pick; can be peeled by a pocketknife.
Low strength	R2	1,000 – 4,000	7 – 28	Can be peeled by a pocketknife with difficulty; shallow indentation made by firm blows of geology pick.
Moderate strength	R3	4,000 – 8,000	28 – 55	Cannot by scraped or peeled with a pocketknife; specimen can be fractured with a single firm blow of geology hammer.
Medium high strength	R4	8,000 – 16,000	55 – 110	Specimen requires more than one blow with a geology hammer to fracture it.
High strength	R5	16,000 – 32,000	110 – 120	Specimen requires many blows of geology hammer to fracture it.
Very high strength	R6	> 32,000	> 220	Specimen can only be chipped with geology pick.

Descriptive Terminology for Joint Spacing or Bedding

Descriptive Term	*Spacing of Joints*	
Very close	Less than 2 inches	< 50 mm
Close	2 inches - 1 foot	50 mm – 300 mm
Moderately close	1 foot - 3 feet	300 mm – 1 m
Wide	3 feet -10 feet	1 m – 3 m
Very wide	Greater than 10 feet	> 3 m

Descriptive Terminology for Vesicularity

Descriptive Term	*Percent voids by volume*
Dense	< 1%
Slightly vesicular	1 – 10%
Moderately vesicular	10 – 30%
Highly vesicular	30 – 50%
Scoriaceous	> 50%

Correlation of RQD and Rock Quality

Rock Quality Descriptor	RQD Value
Very poor	0 – 25
Poor	25 - 50
Fair	50 - 75
Good	75 - 90

SCALE OF ROCK WEATHERING

Stage	*Description*	*Quality Distinction*
Fresh	Rock is fresh, crystals are bright, a few joints may show slight staining because of ground water.	Discoloration
Very Slight	Rock is generally fresh, joints are stained, some joints may have thin clay coatings, crystals in broken faces show bright.	Discoloration only on major discontinuity surfaces [i]
Slight	Rock is generally fresh, joints are stained, and discoloration extends into rock up to 1 in. Joints may contain clay. In granitoid rocks some feldspar crystals are dull and discolored. Rocks ring under hammer if crystalline.	Discoloration on all discontinuity surfaces and on rock
Moderate	Significant portions of rock show discoloration and weathering effects. In granitoid rocks, most feldspars are dull and discolored; some are clayey. Rock has dull sound under hammer and shows significant loss of strength as compared with fresh rock.	Decomposition and/or disintegration < 50% of rock [ii]
Moderately Severe	All rock, except quartz discolored or stained. In granitoid rocks, all feldspars dull and discolored and majority show kaolinization. Rock shows severe loss of strength and can be excavated with geologist's pick. Rock goes "clunk" when struck.	Decomposition and/or disintegration > 50%, but not complete
Severe	All rock, except quartz, discolored or stained. Rock "fabric" is clear and evident but reduced in strength to strong soil. In granitoid rocks, all feldspars kaolinized to some extent. Some fragments of harder rock usually left, such as corestones in basalt.	Decomposition and/or disintegration > 75%, nearly complete
Very Severe	All rock, except quartz, discolored or stained. Rock "fabric" is discernible, but mass effectively reduced to "soil" with only fragments of harder rock remaining.	Decomposition and/or disintegration 100% with structure/fabric intact
Complete	Rock is reduced to "soil". Rock "fabric" is not discernible, or only in small scattered locations. Quartz may be present as dikes or stringers.	Decomposition and/or disintegration 100% with structure/fabric destroyed

NOTES: [i] Discontinuities consist of any natural break (joint, fracture or fault) or plane of weakness (shear or gouge zone, bedding plane) in a rock mass

[ii] Decomposition refers to chemical alteration of mineral grains; disintegration refers to mechanical breakdown

[iii] Stage and description from ASCE Manual No. 56 (1976), quality distinction from Murray (1981)

TEST PIT: GP-01

LOGGED BY: SMW
REVIEWER: AML
ELEVATION:
START DATE: 2026-07-06
END DATE: 2026-07-06

LOCATION: Beatty, OR
EQUIPMENT: Geoprobe 6622
CONTRACTOR: Oregon Geotechnical Explorations, Inc
NOTES:

COORDINATES: 42.44249, -121.27205

Depth	Lithologic Description	Soil Symbol	Samples No.	Samples Type	DCP	Moisture (%)	#200 Fines (%)	Organic Matter (%)	Plasticity Index
0	Silty-Sand SILTY SAND **(SM);** Brown; Moist; Coarse to Fine SAND, Subrounded; Fine GRAVEL, Subrounded; loose to medium dense		S-1	●		19.6	15.00		
2.50 ft	Well Graded Sand Well-graded SAND with SILT **(SW-SM);** Brown to Gray; Moist to Wet; Coarse to Fine SAND; medium dense to very dense, lightly Cemented, pumiceous								
			S-4	●		46.6	5.00		
12.50 ft									

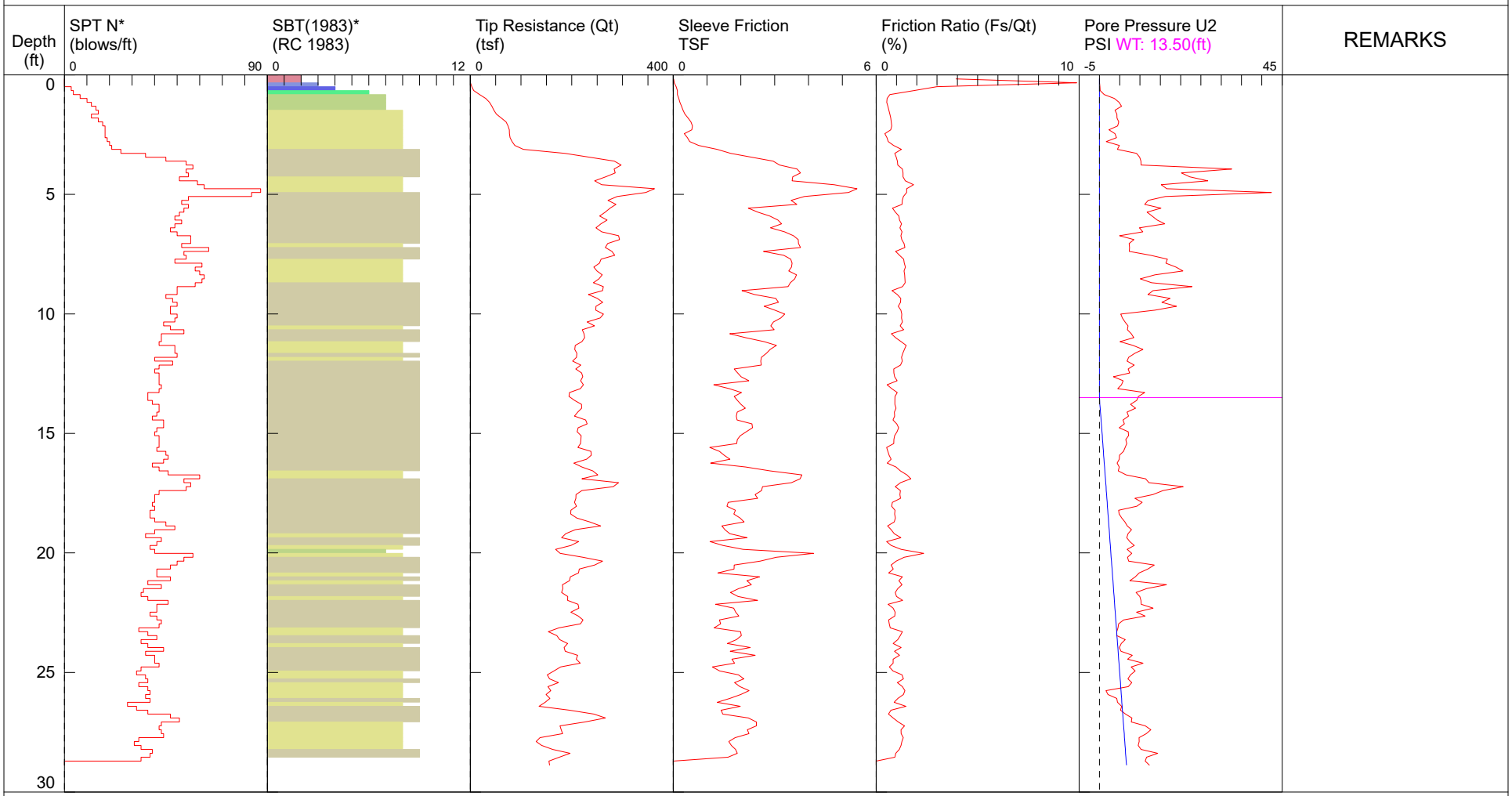
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WALLACE GROUP
NORTHWEST GEOSYSTEM EXPERTS

PROJECT TITLE: Beatty Community Center
PROJECT NO.: 26123-2
CLIENT: Steele Architects and Associates
SHEET: A - 1

Wallace Group / CPT-1 / 24110 Godowa Springs Rd Beatty

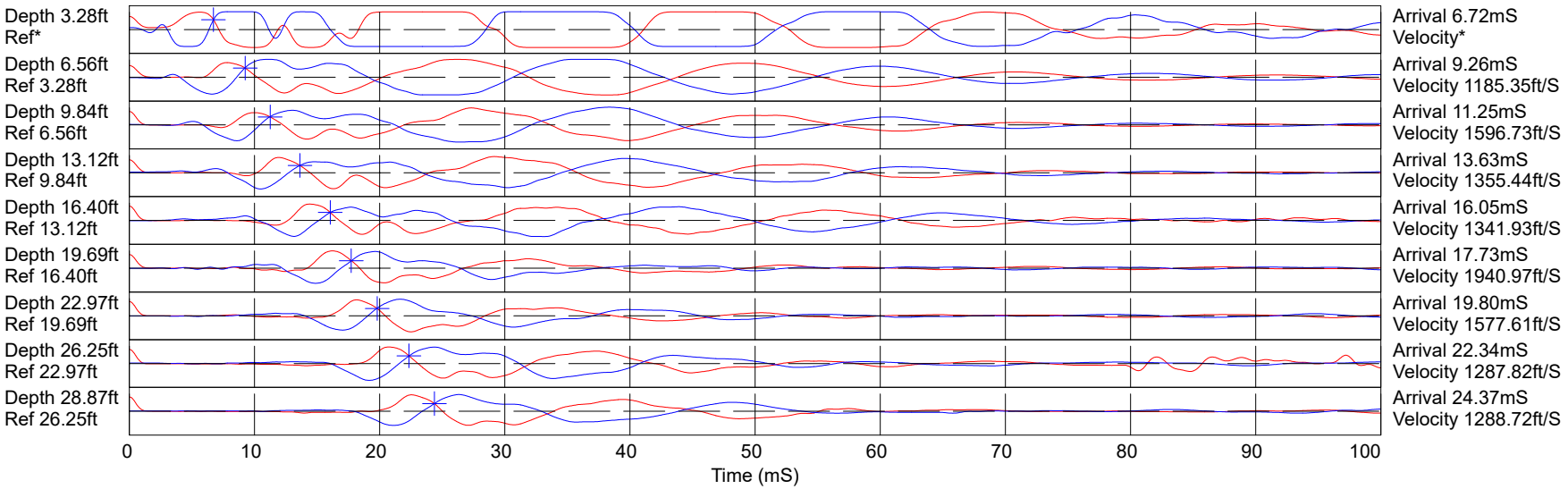
OPERATOR: OGE BAK
TEST DATE: 7/6/2026 11:02:08 AM
CONE ID: DDG1661
TOTAL DEPTH: 28.871 ft
HOLE NUMBER: CPT-1



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: Wallace Group / CPT-1 / 24110 Godowa Springs Rd Beatty

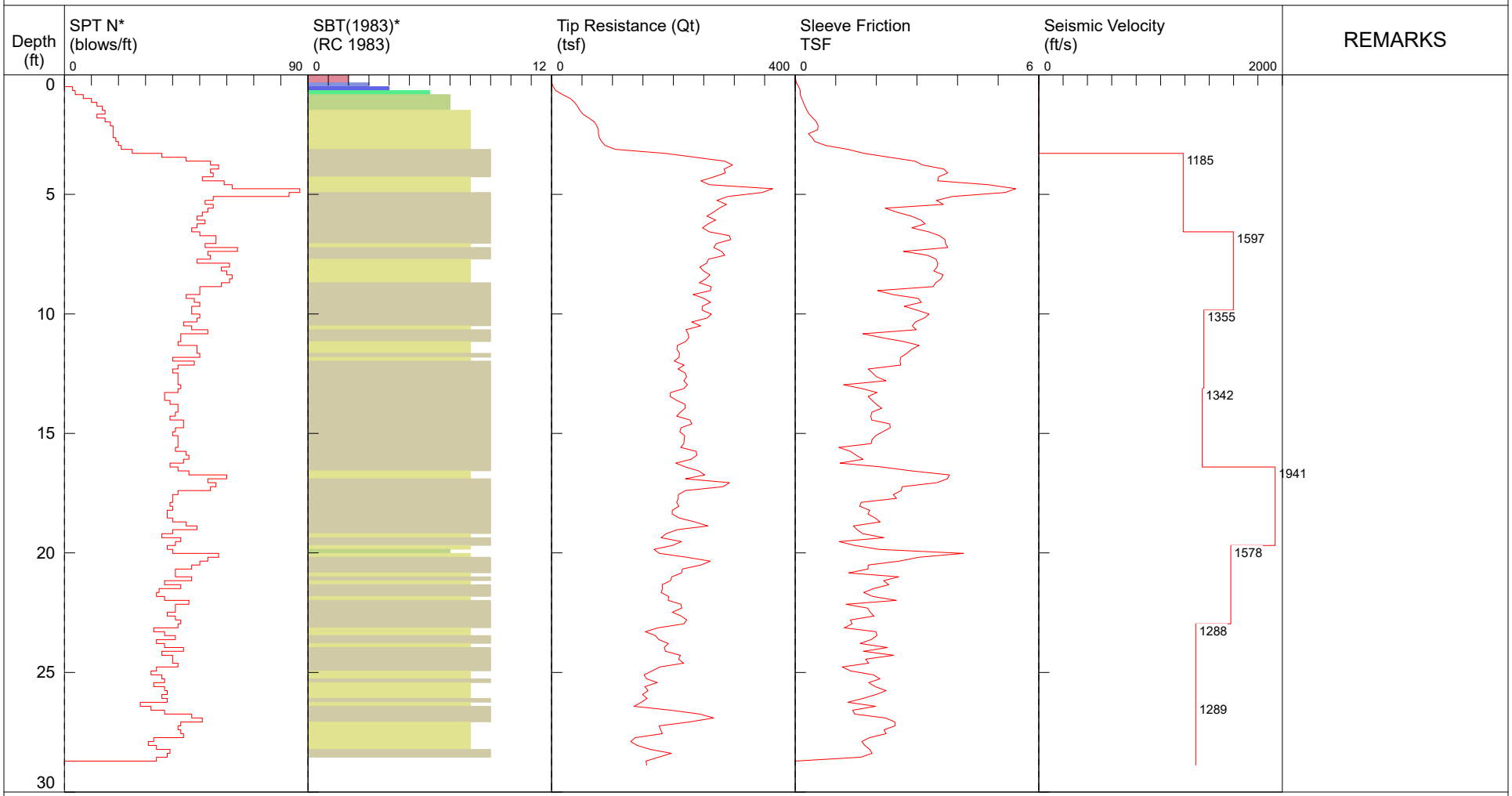


Hammer to Rod String Distance (ft): 2.03
* = Not Determined

COMMENT:

Wallace Group / CPT-1 / 24110 Godowa Springs Rd Beatty

OPERATOR: OGE BAK
TEST DATE: 7/6/2026 11:02:08 AM
CONE ID: DDG1661
TOTAL DEPTH: 28.871 ft
HOLE NUMBER: CPT-1

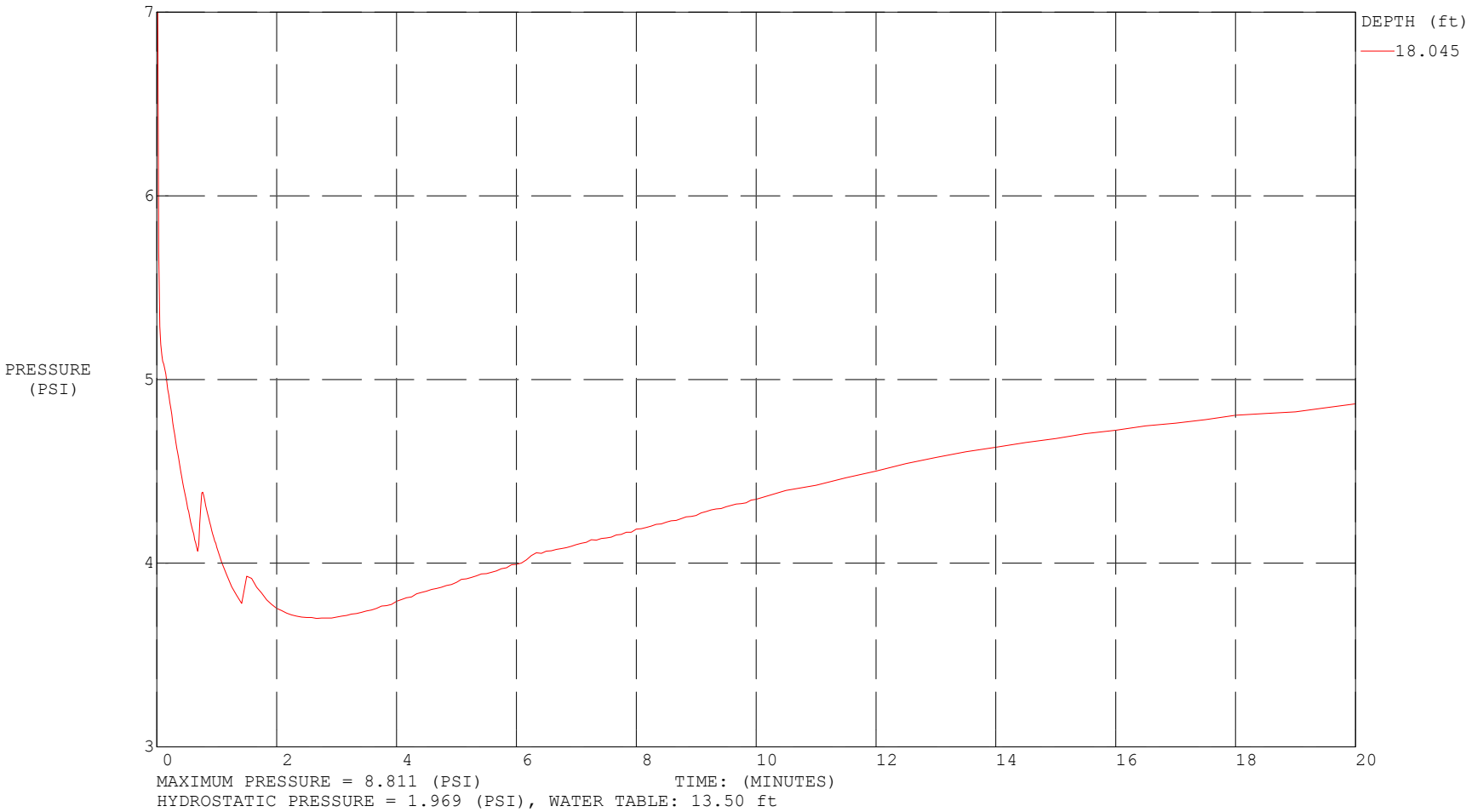


1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

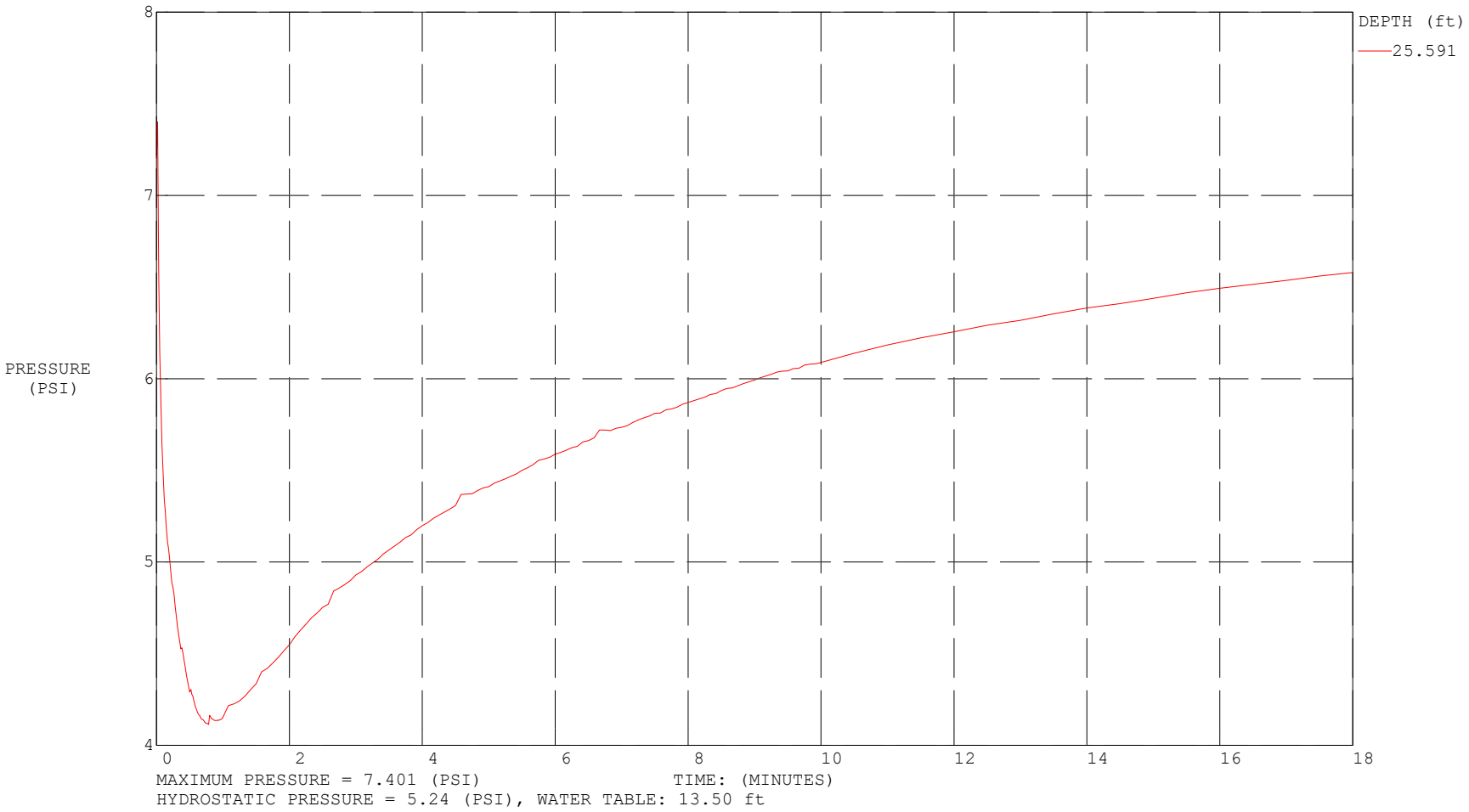
COMMENT: Wallace Group / CPT-1 / 24110 Godowa Springs Rd Beatty

OPERATOR: OGE BAK
CONE ID: DDG1661
TEST DATE: 7/6/2026 11:02:08 AM



COMMENT: Wallace Group / CPT-1 / 24110 Godowa Springs Rd Beatty

OPERATOR: OGE BAK
CONE ID: DDG1661
TEST DATE: 7/6/2026 11:02:08 AM



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APPENDIX B

Sieve Analysis (C117/C136)



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	1	3	42	39	15	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	Not Tested	Not Tested	1.1217	0.4994	0.3712	0.1779	0.0757			

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ Silty Sand	07-21-26	SM	19.6%

Project No. 26123-2 **Client:** Steele Associates

Project: Klamath Tribes: Beatty Community Center

○ **Source of Sample:** GP-01 **Depth:** 0 - 2.5' **Sample Number:** S-1

Remarks:

○ Lab No.: WGG0423

Sampled By: SMW on 07-06-26

C117 Wash Procedure A

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P| 541.382.4707
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62915 NE 18th Street, St. 1
Bend, Oregon 97701

Figure B-1

Tested By: PJH **Checked By:** AML

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Sieve Analysis (C117/C136)



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	1	8	50	36	5	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○	Not Tested	Not Tested	1.6777	0.7684	0.5648	0.2955	0.1599	0.1135	1.00	6.77

MATERIAL DESCRIPTION	TEST DATE	USCS	NM
○ Well Graded Sand with Silt	07-21-26	SW-SM	46.6%

Project No. 26123-2 **Client:** Steele Associates

Project: Klamath Tribes: Beatty Community Center

○ **Source of Sample:** GP-01 **Depth:** 5 - 7.5' **Sample Number:** S-4

Remarks:

○ Lab No.: WGG0423

Sampled By: SMW on 07-06-26

C117 Wash Procedure A

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Figure B-2

Tested By: PJH **Checked By:** AML

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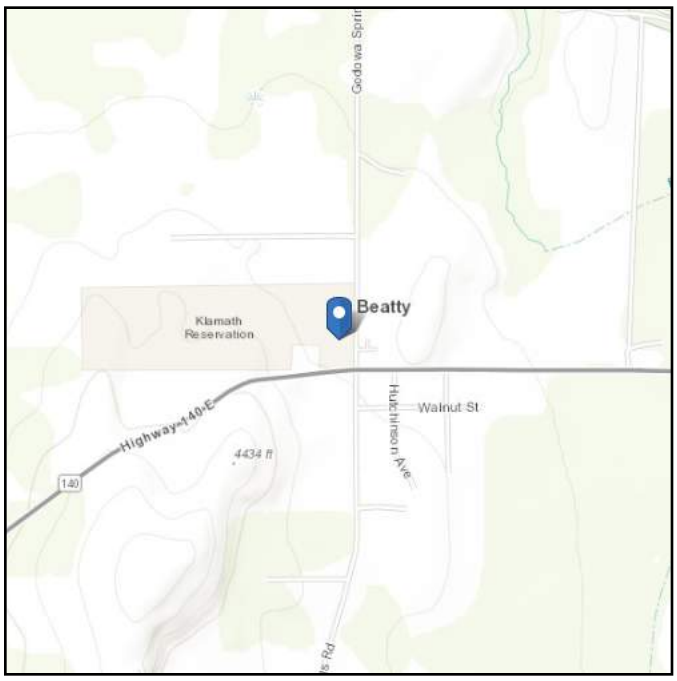
WALLACE GROUP
NORTHWEST GEOSYSTEM EXPERTS

APPENDIX C

ASCE Hazards Report

Address:
No Address at This Location

Standard:	ASCE/SEI 7-22	**Latitude:**	42.44262
Risk Category:	II	**Longitude:**	-121.27193
Soil Class:	CD	**Elevation:**	0 ft (NAVD 88)





Seismic

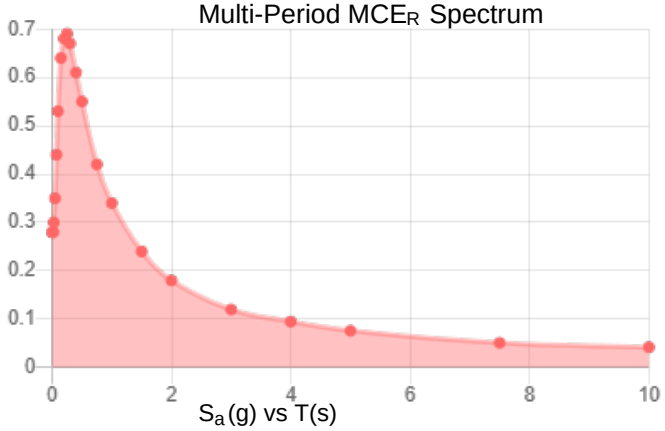
Site Soil Class: CD

Results:

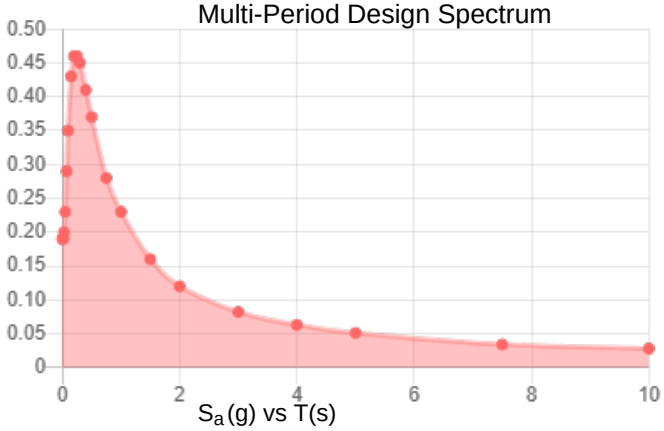
PGA_M :	0.26	T_L :	16
S_{MS} :	0.62	S_S :	0.49
S_{M1} :	0.34	S_1 :	0.18
S_{DS} :	0.41	V_{S30} :	365
S_{D1} :	0.23		

Seismic Design Category: D

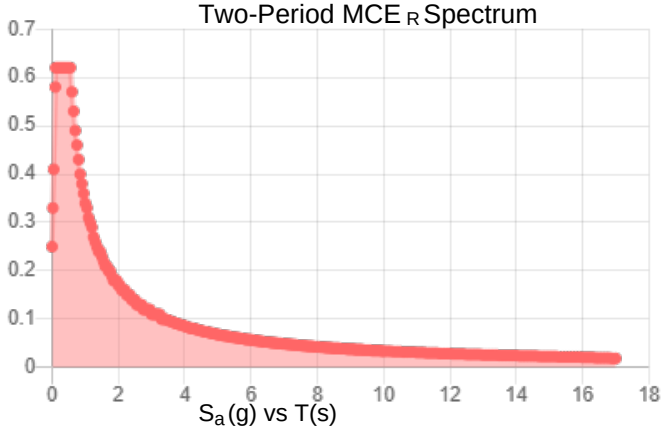
Multi-Period MCE_R Spectrum



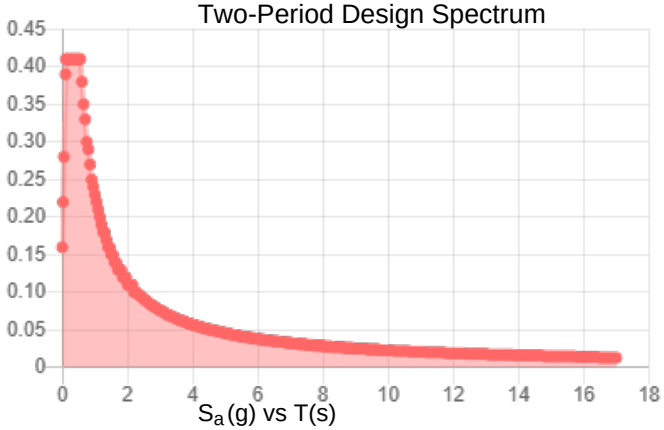
Multi-Period Design Spectrum



Two-Period MCE_R Spectrum



Two-Period Design Spectrum



MCE_R Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Design Vertical Response Spectrum

Vertical ground motion data has not yet been made available by USGS.

Data Accessed: **Mon Jul 13 2026**

Date Source:
USGS Seismic Design Maps based on ASCE/SEI 7-22 and ASCE/SEI 7-22 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-22 Ch. 21 are available from USGS.

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NORTHWEST GEOSYSTEM EXPERTS

APPENDIX D



Existing site conditions. View looks west.



CPTs were performed by OGE on July 6, 2026.



Geoprobes were also performed by OGE on July 6, 2024.



Recovered GP-01 sample at 5- to 8-feet bgs consisting of weathered in place pumice.

SECTION 023213
GEOTECHNICAL REPORT

PART 1 GENERAL

1.01 GEOTECHNICAL REPORT ATTACHED.

END OF SECTION 023213

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SECTION 024100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

1.02 RELATED REQUIREMENTS

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

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

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

D. Section 015000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

E. Section 016000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

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.

1.03 DEFINITIONS

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

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

D. 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

1.05 SUBMITTALS

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

B. Site Plan: Indicate:
   1. Areas for temporary construction and field offices.

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

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 DEMOLITION

A. Remove portions of existing buildings required to complete the scope of work on the project.

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

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

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

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

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

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

3.03 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, Fire Protection, Electrical, and Telecommunications: 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. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.
   4. 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.

3.04 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 024100

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SECTION 030516
UNDERSLAB VAPOR BARRIER - STEGO

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2024.

B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

PART 2 PRODUCTS

2.01 MATERIALS

A. Underslab Vapor Barrier:
   1. Water Vapor Permeance: Not more than 0.010 perms (0.6 ng/(s m2 Pa)), maximum.
   2. Thickness: 15 mils (0.4 mm).
   3. Product:
      a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com/#sle.

B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.

B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.

C. Lap joints minimum 6 inches (150 mm).

D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.

E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.

F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION 030516

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SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete formwork.

B. Floors and slabs on grade.

C. Concrete foundations and anchor bolts for pre-engineered building.

D. Concrete reinforcement.

E. Joint devices associated with concrete work.

F. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.

G. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 3511 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

B. Section 07 1900 - Water repellents: Sealer for exterior concrete flat work.

C. Section 07 9200 - Joint Sealants: Products and installation for sealants for saw cut joints and isolation joints in slabs.

1.03 PRICE AND PAYMENT PROCEDURES

A. Cast-in-place concrete work will be paid for by the unit price method.

B. See Section 01 2200 - Unit Prices, for additional unit price requirements.

C. Concrete - Slab-on-Fill or Slab-on-Grade: Includes formwork , reinforcement , concrete, placement accessories, consolidating and leveling, troweling, and curing. Measurement by:
   1. Cubic yard.

D. Concrete - Vertical in Forms: Includes formwork , reinforcement , concrete, placement accessories, consolidating, and curing. Measurement by:
   1. Cubic yard.

1.04 REFERENCE STANDARDS

A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.

B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).

C. ACI 301 - Specifications for Structural Concrete; 2010 (Errata 2012).

D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; 2004 (Errata 2007).

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000.

F. ACI 305R - Hot Weather Concreting; 2010.

G. ACI 306R - Cold Weather Concreting; 2010.

H. ACI 308R - Guide to Curing Concrete; 2001 (Reapproved 2008).

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2016).

J. ACI 347R - Guide to Formwork for Concrete; 2014.

K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.

M. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016.

N. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2015a.

O. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2015.

P. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.

Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.

R. ASTM C150/C150M - Standard Specification for Portland Cement; 2016.

S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2007.

T. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.

U. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.

V. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.

W. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

X. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.

Y. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures; 2010.

Z. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2014.

AA. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2010.

BB. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.

CC. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.

DD. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2014.

EE. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.

FF. ASTM C1582/C1582M - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete; 2011.

GG. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type); 2011.

HH. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004 (Reapproved 2013).

II. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.

JJ. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover; 2008a (Reapproved 2013).

KK. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996 (Reapproved 2008).

LL. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

MM. ASTM E1993/E1993M - Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs; 1998 (Reapproved 2013).

NN. COE CRD-C 48 - Method of Test for Water Permeability of Concrete; 1992.

OO. NSF 61 - Drinking Water System Components - Health Effects; 2014 (Errata 2015).

PP. NSF 372 - Drinking Water System Components - Lead Content; 2011.

1.05 SUBMITTALS

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

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

D. Samples for Pigment Color Selection: Submit manufacturer's complete sample chip set, including pigment number and required dosage rate for each color.

E. Verification Samples: Submit sample chips of specified colors indicating pigment numbers and required dosage rates, for subsequent comparison to installed concrete.

F. Samples: Submit samples of underslab vapor retarder to be used.

G. Samples: Submit two, 12 inch long samples of waterstops and construction joint devices.

H. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

I. 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 .

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

K. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

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

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

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

D. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for life of the concrete.
   1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
   2. Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

C. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 FORMWORK

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

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

2.02 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished , unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
   1. Form: Flat Sheets.
   2. WWR Style: 4 x 8-W6 x W10.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.03 CONCRETE MATERIALS

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

B. Fine and Coarse Aggregates: ASTM C 33.
   1. Acquire all aggregates for entire project from same source.

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

D. Calcined Pozzolan: ASTM C618, Class N.

E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

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.
   2. Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured disintegrating bags to minimize job site waste.
   3. Color(s): As selected by Architect from manufacturer's full range.
   4. Manufacturers:
      a. Butterfield Color ; U22 - Salt Marsh Gray: www.butterfieldcolor.com.
      b. Davis Colors ; Pebble 641: www.daviscolors.com.

c. L.M. Scofield Company; C-12 Mesa Beige ; CHROMIX® Admixtures for Color-Conditioned® Concrete: www.scofield.com.
d. Substitutions: See Section 01 6000 - Product Requirements.

G. Water: Clean 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 Accelerating Admixture: ASTM C494/C494M Type E.

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

G. Accelerating Admixture: ASTM C494/C494M Type C.

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

I. Water Reducing Admixture: ASTM C494/C494M Type A.

J. Shrinkage Reducing Admixture:
1. ASTM C494/C494M, Type S.

K. Moisture Vapor Reduction Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission, with no adverse effect on concrete properties.
1. Provide admixture in slabs to receive adhesively applied flooring.
2. Manufacturers:
a. Barrier One, Inc ; Barrier One Moisture Vapor Reduction Admixture: www.barrierone.com.
b. Hycrete, Inc ; V1000: www.hycrete.com.
c. Specialty Products Group ; Vapor Lock 20/20: www.spggogreen.com.
d. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Underslab Vapor Retarder: Multi-layer, fabric-, cord-, grid-, or aluminum-reinforced polyethylene or equivalent, complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
1. Installation: Comply with ASTM E1643.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations in vapor retarder.
3. Manufacturers:
a. Fortifiber Building Systems Group; Moistop Ultra 15: www.fortifiber.com/sle.
b. Insulation Solutions, Inc; Viper VaporCheck II 15-mil (Class A): www.insulationsolutions.com.
c. Stego Industries, LLC; Stego Wrap vapor barrier (15mil): www.stegoindustries.com.
d. W.R. Meadows, Inc.; PERMINATOR Class A - 15 mils: www.wrmeadows.com/sle.
e. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
1. Grout: Comply with ASTM C1107/C1107M.
2. Height Change, Plastic State; when tested according to ASTM C827/C827M:
a. Maximum: Plus 4 percent.
b. Minimum: Plus 1 percent.

3. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
4. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.
5. Flowable Products:
   a. Five Star Products, Inc ; Five Star Fluid Grout 100: www.fivestarproducts.com.
   b. Kaufman Products Inc.; SureGrout: www.kaufmanproducts.net.
   c. ProSpec, an Oldcastle brand ; C-1107 Construction Grout: www.prospec.com.
   d. Substitutions: See Section 01 6000 - Product Requirements.
6. Low-Slump, Dry Pack Products:
   a. Dayton Superior Corporation; Turbo Grout LT 12: www.daytonsuperior.com.
   b. Five Star Products, Inc ; Five Star Grout: www.fivestarproducts.com.
   c. The QUIKRETE Companies ; QUIKRETE® FastSet™ Non-Shrink Grout: www.quikrete.com.
   d. Substitutions: See Section 01 6000 - Product Requirements.

C. Non-Shrink Epoxy Grout: Moisture-insensitive, two-part; consisting of epoxy resin, non-metallic aggregate, and activator.
1. Composition: High solids content material exhibiting positive expansion when tested in accordance with ASTM C827/C827M.
   a. Maximum Height Change: Plus 4 percent.
   b. Minimum Height Change: Plus 1 percent.
2. Manufacturers:

2.06 BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

B. Epoxy Bonding System:

C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with minimum 1 inch diameter holes for conduit or rebars to pass through at 6 inches on center; ribbed steel stakes for setting.

2.07 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.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
1. Manufacturers:

C. Curing and Sealing Compound, High Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
1. Vehicle: Water-based.
2. Solids by Mass: 25 percent, minimum.

D. Moisture-Retaining Sheet: ASTM C171.
1. Polyethylene film, clear, minimum nominal thickness of 0.0040 inch.

E. Water: Potable, not detrimental to concrete.

2.08 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 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 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 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: 3,000 pounds per square inch.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
   4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
   5. Cement Content: Minimum 470 lb per cubic yard.
   6. Water-Cement Ratio: Maximum 50 percent by weight.
   7. Total Air Content: 2% (+/- 1.5%) percent, determined in accordance with ASTM C173/C173M.
   8. Maximum Slump: 3 inches.
   9. Maximum Aggregate Size: 5/8 inch.

2.09 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

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 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 with steel brush and applying bonding agent in accordance with 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.
   2. Use latex bonding agent only for non-load-bearing applications.

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

F. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
   1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as shown on the drawings. Do not use sand.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

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

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

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

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

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.

3.05 SLAB JOINTING

A. Locate joints as indicated on the drawings.

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

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
   1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to view and foot traffic: F(F) of 25; F(L) of 20.
   2. Under Carpeting: F(F) of 25; F(L) 20.
   3. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25.
   4. Under Athletic Wood Flooring: 1/8 inch in radius of 10 feet.
      a. High spots shall be ground level and low spots shall be

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E 1155, wihin 48 hours after slab installation. Report both composite overall values and local vallues for each measured section.

C. Correct the slab surface of composite overall values is less than specified and if local value is less than two-thirds of specified valule or less tha F(F) 13/F(L) 10.

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

3.07 CONCRETE FINISHING

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

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, and surfaces to be polished.
      a. Refer to Specification Section 03 3511.
   3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

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

3.08 CURING AND PROTECTION

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

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

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

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

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

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.10 DEFECTIVE CONCRETE

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

B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

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

END OF SECTION 033000

SECTION 033511
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Penetrating sealers.

B. Surface treatments.

C. Liquid densifiers and hardeners.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 033000 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

B. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Samples for verification: Provide four 6 x 6 inch samples showing polishing effect on same concrete mix scheduled in Section 03 3000 for floor slabs.

D. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 MOCK-UPS

A. For coatings and finishes, construct mock-up area under conditions similar to those that will exist during application, with coatings applied.

B. Locate as indicated on drawings.

C. Mock-up may remain as part of the work.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.07 FIELD CONDITIONS

A. Maintain light level equivalent to a minimum 200 W light source at 8 feet (2.5 m) above the floor surface over each 20 foot (6 m) square area of floor being finished.

B. Do not finish floors until interior heating system is operational.

C. Maintain ambient temperature of 50 degrees F (10 degrees C) minimum.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Unless otherwise indicated on drawings, finish concrete floors using troweling aid, densifier, and curing agent.

2.02 SURFACE TREATMENTS

A. Troweling Aid, Densifier and Curing Agent: Liquid reactive colloidal silica-based topical treatment, spray-applied to wet concrete and floated or troweled into the surface.

2.03 DENSIFIERS AND HARDENERS

A. Liquid Densifier and Hardener: Penetrating chemical compound that reacts with concrete, filling the pores, hardening, and dustproofing.

1. Products:
    a. Euclid Chemical Company; ULTRASIL LI+: www.euclidchemical.com/#sle.
    b. L&M Construction Chemicals, Inc; LiON HARD: www.lmcc.com/#sle.
    c. PROSOCO, Inc; Consolideck LS/CS: www.prosoco.com/consolideck/#sle.
    d. SpecChem, LLC; LithSeal SC: www.specchemllc.com/#sle.
    e. Substitutions: See Section 016000 - Product Requirements.
2. Composition: Sodium silicate, with siliconate.
    a. Products:
        1) Substitutions: See Section 016000 - Product Requirements.
        2) Euclid Chemical Company; EUCOSIL: www.euclidchemical.com/#sle.
        3) L&M Construction Chemicals, Inc; SEAL HARD: www.lmcc.com/#sle.
        4) SpecChem, LLC; Cure Hard: www.specchemllc.com/#sle.
        5) W. R. Meadows, Inc; Med-Cure: www.wrmeadows.com/#sle.

2.04 COATINGS

A. Penetrating Sealer: Transparent, nonyellowing, water-based coating.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 COATING APPLICATION

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

E. Protect installed coatings from subsequent construction operations.

F. Do not permit traffic over unprotected floor surface.

3.04 PROTECTION

END OF SECTION 033511

SECTION 047300
MANUFACTURED STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered manufactured stone masonry veneer (AMSMV).

B. Installation materials.

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 040511 - Masonry Mortaring and Grouting: Site-mixed mortars.

B. Section 061000 - Rough Carpentry: Wood stud backup for AMSMV; plywood and OSB sheathing.

C. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.

D. Section 092116 - Gypsum Board Assemblies: Cementitious backer board and gypsum sheathing.

1.03 REFERENCE STANDARDS

A. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2026.

B. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2026.

C. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2025a.

D. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2026.

E. ASTM C1780 - Standard Practice for Installation Methods for Cement-Based Adhered Masonry Veneer; 2026.

F. NCMA TEK 20-01 - Key Installation Checkpoints for Manufactured Stone Veneer; 2014.

1.04 SUBMITTALS

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

B. Product Data: Provide data for AMSMV units, lightweight synthetic stone veneer, mortar, lath, rainscreen drainage material, and water-resistive barrier, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Color charts.
   4. Installation methods.

C. Shop Drawings: Submit detail drawings depicting proper installation and flashing techniques. Coordinate locations with those found on drawings.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum ten years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified, with at least five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect products from precipitation combined with freezing temperatures. Do not install products with visible frozen moisture.

C. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.

1.07 FIELD CONDITIONS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

1.08 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Adhered Manufactured Stone Masonry Veneer (AMSMV):
   1. Basis of Design: Eldorado Stone; Mountain Ledge: Mesa Verde: www.eldoradostone.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 MORTAR APPLICATIONS

A. At Contractor's option, mortar may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Scratch Coat Mortars: Scratch coat mortars for application directly to metal lath.
   1. Site-Mixed: ASTM C270, Type N or Type S, using the Proportion Method as specified in Section 040511.

D. Setting Bed Mortars: Setting bed used to adhere AMSMV units to scratch coat mortar or to bondable concrete or concrete masonry.
   1. Site-Mixed: ASTM C270, Type S, using the Proportion Method as specified in Section 040511.

E. Setting Bed Mortars: Setting bed used to adhere AMSMV units to cement board.

F. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual AMSMV units once the setting bed mortar has sufficiently cured.
   1. Site-Mixed: ASTM C270, Type N or Type S, using the Proportion Method as specified in Section 040511.

2.03 MORTAR MIXES

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of specified strength in accordance with ASTM C270 with addition of water only.
   1. Type: Type S.
   2. Color: Mineral pigments added as required to produce approved color sample.

B. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

2.04 ACCESSORIES

A. Lath: As required by manufacturer installation instructions.

B. Water-Resistive Barrier: See Section 072500.

C. Flashings: See Section 042000.

D. Rainscreen Drainage Material:
   1. Drainage Mat: _____ with polypropylene fabric mortar screen on one face.
      a. Thickness: 1/8 inch.
      b. Manufacturers:

1) Mortar Net Solutions; <>: www.mortarnet.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that related items provided under other sections are properly sized and located.

B. Verify that built-in items are in proper location, and ready for installation of AMSMV.

3.02 INSTALLATION - WATER-RESISTIVE BARRIER

3.03 INSTALLATION - RAINSCREEN DRAINAGE MATERIAL

A. Install rainscreen drainage material and metal lath with accessories over sheathing material and water-resistive barrier with fastening system in accordance with ASTM C1063 into wood or metal studs. Install drainage material with filter fabric mortar screen to exterior.

3.04 INSTALLATION - SCRATCH COAT

A. Apply mortar scratch coat of 1/2 inch nominal to cover metal lath in accordance with ASTM C926. Scratch surface when somewhat firm. If scratch coat dries before applying setting bed mortar and AMSMV, moisten scratch coat by misting it with water.

3.05 INSTALLATION - MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

3.06 TOLERANCES

A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

3.07 CUTTING AND FITTING

3.08 CLEANING

A. Clean soiled surfaces with cleaning solution.

3.09 PROTECTION

A. Protect finished work from rain during and for 48 hours following installation.

END OF SECTION 047300

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SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Nonstructural dimension lumber framing.

C. Sheathing.

D. Underlayment.

E. Communications and electrical room mounting boards.

F. Concealed wood blocking, nailers, and supports.

G. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

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

B. Section 061500 - Wood Decking.

C. Section 061736 - Metal-Web Wood Joists.

D. Section 072500 - Weather Barriers: Water-resistive barrier over sheathing.

E. Section 076200 - Sheet Metal Flashing and Trim: Sill flashings.

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

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

D. PS 1 - Structural Plywood; 2023.

E. PS 2 - Performance Standard for Wood Structural Panels; 2019.

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

G. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.04 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

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

B. Lumber fabricated from old growth timber is not permitted.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

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

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

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)), as indicated on drawings:
   1. Species: Douglas Fir-Larch.
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 (50 by 150 mm through 100 by 400 mm)):
   1. Species: Douglas Fir-Larch.

2.03 STRUCTURAL COMPOSITE LUMBER

2.04 CONSTRUCTION PANELS

A. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
   1. Grade: Structural 1 Sheathing.
   2. Bond Classification: Exposure 1.
   3. Performance Category: 5/8 PERF CAT.
   4. Span Rating: 40/20.

B. Roof Sheathing: Oriented strand board structural wood panel, PS 2, with factory laminated roofing underlayment layer.
   1. Sheathing Panel:
      a. Grade: Structural 1 sheathing.
      b. Size: 4 feet (1219 mm) wide by 8 feet (2438 mm) long.

C. Wall Sheathing: PS 2 type.
   1. Bond Classification: Exterior.
   2. Grade: Structural I Sheathing.
   3. Span Rating: 16.
   4. Performance Category: 1/2 PERF CAT.
   5. Edge Profile: Square edge.

D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

E. Metal and Finish of Fasteners:
   1. Untreated Wood: Unfinished steel.

2.05 ACCESSORIES

A. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
   1. For contact with preservative treated wood in exposed locations, provide minimum G185 (Z550) galvanizing complying with ASTM A653/A653M.
   2. Width: 3-1/2 inches (89 mm).
   3. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

B. Sill Gasket on Top of Foundation Wall: 3/8 inch (9.5 mm) thick, closed-cell plastic foam.

C. Sill Flashing: See Section 076200.

D. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.

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

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

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

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

3.03 FRAMING INSTALLATION

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

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

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

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

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

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

G. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using fasteners as indicated on drawings.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.05 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.06 CLEANING

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

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

END OF SECTION 061000

SECTION 061053
MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-retardant treatment (FRT).

B. Communications and electrical room mounting boards.

C. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

A. APA E30 - Engineered Wood Construction Guide; 2019.

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

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

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

E. PS 1 - Structural Plywood; 2023.

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

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

1.03 SUBMITTALS

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

B. Product Data:
   1. Fire-retardant treatment.

1.04 DELIVERY, STORAGE, AND HANDLING

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

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.

2.02 DIMENSION LUMBER

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

B. Moisture Content: S-dry or MC19.

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

2.03 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1, A-D plywood; 3/4 inch (19 mm) thick; fire-retardant treated.

2.04 FIRE-RETARDANT TREATMENT (FRT)

A. Provide factory-treated wood members in accordance with AWPA U1 and use category indicated.

B. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (LT), Low-Temperature (low hygroscopic).

1. Treat electrical and communications panel backer boards.

C. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.

D. Fabrication of FRT Wood:
   1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
   2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
   3. Field cutting and drilling of holes in plywood are permitted.

E. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke-developed indexes, method of drying after treatment, and treating standard.

2.05 ACCESSORIES

A. Metal and Finish of Fasteners:
   1. Fire-Retardant-Treated Wood:
      a. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
   2. Untreated Wood: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.

PART 3 EXECUTION

3.01 PREPARATION

3.02 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.

3.03 BLOCKING, NAILERS, AND SUPPORTS

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

B. In 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. Where ceiling mounting is indicated, provide blocking and supplementary supports above ceiling unless another method of support is explicitly indicated.

3.04 INSTALLATION OF CONSTRUCTION PANELS

A. Construction Panels - General: Install in accordance with APA E30.

B. Communications and Electrical Room Mounting Boards: Secure with screws to studs; space fasteners at maximum 24 inches (610 mm) on center.
   1. At fire-rated walls, install board over wallboard indicated as part of fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.

3.05 CLEANING

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

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

END OF SECTION 061053

SECTION 061736
METAL-WEB WOOD JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Joists for roof and floor framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

1.02 REFERENCE STANDARDS

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

B. WCLIB (GR) - WCLB Standard Grading Rules for West Coast & Imported Softwood Lumber No.18; 2024.

C. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.03 SUBMITTALS

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

B. Product Data: Provide joist configurations, bearing and anchor details, bridging and bracing.

C. Shop Drawings: Indicate framing system, sizes and spacing of joists, loads and joist cambers, required openings for web penetrations, framed openings. Submit design calculations.
   1. Include the design engineer's seal and signature on each sheet of shop drawings.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design joists under direct supervision of a Professional Structural Engineer experienced in design of this product type and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with minimum Five years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Joists:
   1. RedBuilt LLC; Open Web Trusses: www.redbuilt.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Wood Chord Members: Double top and bottom chord, Stress Group <>, 19 percent maximum moisture content.

B. Web Members: Cold rolled steel tubing, electrogalvanized, minimum yield strength of 45,000 psi (_____ MPa), accurately die stamped, electrically welded.

C. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

2.03 FABRICATION

A. Fabricate joists to achieve structural requirements indicated.

2.04 ACCESSORIES

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

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

C. Bearing Plates: Electrogalvanized, unfinished steel.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify that field measurements are as indicated.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install joists in accordance with manufacturer's instructions.

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

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Install permanent bridging and bracing.

E. Install headers and supports to frame openings required.

F. Coordinate installation of sheathing/decking.

3.04 TOLERANCES

A. Framing Members: 1/4 inch (____ mm) maximum, from true position.

END OF SECTION 061736

SECTION 061800
GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glue laminated wood beams.

B. Steel hardware and attachment brackets.

1.02 REFERENCE STANDARDS

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

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.

C. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2024).

D. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.03 SUBMITTALS

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

B. Product Data: Provide technical data on wood treatment.

C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings.
   1. Submit design calculations signed and sealed by design engineer.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Design structural members under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect members to AITC requirements for not wrapped.

B. Leave individual wrapping in place until finishing occurs.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glued-Laminated Structural Units:
   1. Boise Cascade Company: www.bc.com/#sle.
   2. RedBuilt LLC; Glulam Beams: www.redbuilt.com//#sle.
   3. Sentinel Structures, Inc.: www.sentinelstructures.com.
   4. Unit Structures: www.unitstructures.com.
   5. Western Wood Structures, Inc.: www.westernwoodstructures.com.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Architectural Grade Glued-Laminated Columns:
   1. Boise Cascade Company; ____: www.bc.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 GLUED-LAMINATED UNITS

A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Architectural grade.
   1. Verify dimensions and site conditions prior to fabrication.
   2. Cut and fit members accurately to length to achieve tight joint fit.
   3. Do not splice or join members in locations other than those indicated without permission.
   4. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

2.03 MATERIALS

A. Lumber: Softwood lumber conforming to WWPA G-5 grading rules with 12 percent maximum moisture content before fabrication.
   1. Lumber fabricated from old growth timber is not permitted.

B. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.

C. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

2.04 FABRICATION

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

B. Cut and fit members accurately to length to achieve tight joint fit.

C. Fabricate member with camber built in.

D. Do not splice or join members in locations other than those indicated without permission.

E. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that supports are ready to receive units.

B. Verify sufficient end bearing area.

3.02 ERECTION

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

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

C. Provide temporary bracing and anchorage to hold members in place until permanently secured.

D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.

E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.

3.03 TOLERANCES

A. Framing Members: 1/2 inch (12 mm) maximum from true position.

END OF SECTION 061800

SECTION 064100
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood casework with laminate cladding.

B. Cabinet and drawer hardware.

1.02 RELATED REQUIREMENTS

A. Section 061053 - Miscellaneous Rough Carpentry.

B. Section 061000 - Rough Carpentry.

1.03 ABBREVIATIONS AND ACRONYMS

A. AWI: Architectural Woodwork Institute.

B. HPDL: High-pressure decorative laminate.

C. Section 123600 - Countertops.

1.04 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI/AWI 0641 - Architectural Wood Casework; 2019.

C. AWI 100 - Submittals; 2018.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

E. BHMA A156.9 - Cabinet Hardware; 2020.

F. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

G. PS 1 - Structural Plywood; 2023.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate schedule of climate-controlled rooms with schedule of storage of wood and wood-based materials requiring climate-controlled environments.
   2. Coordinate work of this section with rough-in plumbing and rough-in electrical integrally-related with casework.

B. Preinstallation Meeting: Convene preinstallation meeting not less than one week prior to completion of framing behind casework; require attendance of contractor, framing contractor, and casework fabricator.

C. AWI QCP Program Submittal Requirements: Comply with AWI 100.

D. Shop Drawings:
   1. General: Each sheet sequentially numbered and dated.
   2. Samples, Laminate-Clad Panels: For each laminate-clad type, submit two, laminate-clad sample panels; size: 8 by 8 inches (200 by 200 mm); thickness: 3/4 inch (19 mm).
   3. Samples, Hardware: For each hinge, pull, catch, latch, shelf rest, and cabinet lock type, submit one sample, full-size, indicating specified finish.
   4. Samples, Laminates: For each laminate type, submit two samples for each specified color.

E. Samples:

1.06 SUBMITTALS

   a. Contents: Indicate project name and project address.

2. AWI QCP Program Shop Drawing Requirements:
   a. Comply with AWI 100 for shop drawing front matter documentation.
   b. Reference Plans: Casework locations in relative context of building floor plans.

1) Drawing Scale: 1/4 inch = 1 foot (1:50), minimum.
c. Plans and Elevations: Plan and elevation views of each assembly type.
1) Include rough opening dimensions and casework assembly dimensions.
2) Drawing Scale: 3/4 inch = 1 foot (1:20), minimum.
d. Detailed Sections: Dimensioned section views of each casework configuration.
1) Include appropriate locations for casework wall anchorage.
2) Drawing Scale: 1-1/2 inch = 1 foot (1:10), minimum.
3. Reference Plans: Casework locations in relative context of building floor plans.

B. See Section 013000 - Administrative Requirements for submittal procedures.
1. AWI QCP Program Requirements for Samples: Comply with AWI 100.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1.07 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: Firm specializing in fabricating and installing products specified in this section with minimum five years of experience; with qualifications indicating ability to comply with requirements of this section.

B. Architectural Woodwork Institute (AWI) Quality Certification Program (QCP):

1.08 DELIVERY, STORAGE, AND HANDLING

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

B. Deliver products in original packaging materials bearing product identification.

C. Store products prior to installation on flat, level, clean surfaces; elevate products above floors and protect from sunlight.

D. Store products in interior rooms with completed wet work and overhead work.

PART 2 PRODUCTS

2.01 ARCHITECTURAL WOOD CASEWORK

A. Provide casework and casework components in sizes and profiles as indicated on drawings.

2.02 WOOD CASEWORK WITH LAMINATE CLADDING

A. Casework Construction:
1. Exposed Exterior Surfaces, Panels to Receive Laminate Cladding:
2. Exposed Interior Surfaces at Door and Drawer Fronts, Panels Receiving Laminate Cladding:
3. Exposed Interior Surfaces Except Door and Drawer Front Surfaces, Panels to Receive Laminate Cladding:

B. Edgebanding Applications for Laminate-Clad Wood Casework:
1. Drawer Box Top Edges:

C. Edgebanding Materials for Laminate-Clad Wood Casework:

D. Scribed Fillers:

E. Casework Finish: Wood casework with laminate cladding.

F. Adjustable Shelves, Number of Shelves Per Cabinet Unit:

2.03 CONCEALED CABINET BASE COMPONENTS

A. Cabinet Base Toe-Kick Subfronts:

B. Cabinet Base Blocking and Stretchers:

C. Cabinet Base Sleepers:

2.04 WOOD AND WOOD-BASED MATERIALS

1. Base Cabinets: One shelf for each cabinet unit.

2. Wall Cabinets: Two shelves for each cabinet unit.
3. Finish and Materials: Same materials and finish as exposed surfaces.

B. Custom Grade - Laminate-Clad Wood Casework:
1. Frameless Cabinet and Door Interface: Flush overlay.
2. Door and Drawer Front Profile: Flush.

2.05 FABRICATION

A. Fabricate to maximum extents plausible, including doors, drawers, and hardware; fabricate units in sizes transportable through building openings.

B. When necessary to cut and fit on site, provide materials with sufficient allowance for cutting.

C. Wood Casework with Laminate Cladding: Apply laminates in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.

D. WI Certified Compliance Labels: Indicate compliance with WI Certified Compliance Program by applying WI Certified Compliance Labels on each casework elevation.

E. Provide cutouts for plumbing fixtures; verify locations of cutouts from on-site dimensions. Sand and seal cut edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify casework and materials required for installation have been delivered, handled and stored as specified.

B. Verify location and sizes of rough-in plumbing and rough-in electrical associated with work of this section.

3.02 INSTALLATION

A. Install and secure work of this section in accordance with specified performance requirements.

3.03 FIELD QUALITY CONTROL

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

B. AWI QCP Inspection Services: Provide AWI QCP installation inspection services.
1. Inspect for compliance with contract documents; on subjects contract documents are silent, inspect for compliance with specified AWI aesthetic grade.

3.04 ADJUSTING

A. Adjust hardware for smooth operation in accordance with hardware manufacturer's documented instructions.

B. See Section 017000 - Execution and Closeout Requirements for additional requirements.

3.05 CLEANING

END OF SECTION 064100

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SECTION 068316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.02 REFERENCE STANDARDS

A. 9 CFR 416.2 - Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation; current edition.

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

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

E. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water; 2017.

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. Samples: Submit two samples 4 by 4 inch (____by____ mm) in size illustrating material and surface design of panels.

1.04 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:
   1. VALTO Engineered Materials: www.valtoem.com/#sle.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PANEL SYSTEMS

A. Wall Panels:
   1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).
   2. Surface Design: Varietex Linen Texture.
   3. Color: #8044 Pepper Dust.
   4. Attachment Method: Adhesive only, sealant joints, no trim.

2.03 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Sanitation and Cleanability: Comply with 9 CFR 416.2.
   4. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.

B. Adhesive: Type recommended by panel manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.

B. Verify that substrate conditions are ready to receive the work of this section.

3.02 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.

B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.

C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.

D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.

E. Install panels with manufacturer's recommended gap for panel field and corner joints.

F. Fill channels in trim with sealant before attaching to panel.

G. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.

H. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION 068316

SECTION 070553
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

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

1.04 FIELD CONDITIONS

A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl or paper sign with factory applied adhesive backing.

C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 099123 for products.

D. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.01 PREPARATION

A. See Section 099123 for substrate preparation for painted markings.

3.02 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 099123.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION 070553

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SECTION 071113
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous dampproofing.

B. Protection boards.

C. Drainage panels.

1.02 RELATED REQUIREMENTS

A. Section 312323 - Fill.

1.03 REFERENCE STANDARDS

A. ASTM D449/D449M - Standard Specification for Asphalt Used in Dampproofing and Waterproofing; 2003 (Reapproved 2021).

B. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal; 1997 (Reapproved 2024).

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

1.04 SUBMITTALS

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

B. Product Data: Provide properties of primer, bitumen, and mastics.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F (5 degrees C) for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 BITUMINOUS DAMPPROOFING

A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.
   1. Asphalt-Base Emulsion for Metal Protective Coating: ASTM D1187/D1187M, Type I - Continuous water exposure within few days after drying or Type II - Continuous weather exposure after drying.
   2. VOC Content: Not more than permitted by local, State, and federal regulations.
   3. Applied Thickness: 1/16 inch (1.5 mm), minimum, wet film.
   4. Products:
      a. W. R. Meadows, Inc; Sealmastic Emulsion Type I (spray-grade): www.wrmeadows.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

B. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

2.03 ACCESSORIES

A. Drainage Panel: 1/4-inch (6 mm) thick formed plastic, hollowed sandwich.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

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

3.02 APPLICATION

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

C. Prime surfaces at a rate approved by manufacturer for application indicated, and allow primer to dry thoroughly.

D. Apply bitumen with mop.

E. Apply from 2 inches (50 mm) below finish grade elevation down to top of footings.

F. Seal items watertight with mastic, that project through dampproofing surface.

G. Place drainage panel directly over dampproofing, butt joints, and position to ensure downward drainage.

H. Scribe and cut boards around projections, penetrations, and interruptions.

END OF SECTION 071113

SECTION 071900
WATER REPELLENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water repellents applied to exterior, stone surfaces.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM C140/C140M - Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2026a.

B. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2021.

C. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2025.

D. ASTM D5095 - Standard Test Method for Determination of the Nonvolatile Content in Silanes, Siloxanes and Silane-Siloxane Blends Used in Masonry Water Repellent Treatments; 1991 (Reapproved 2022).

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a meeting at least one week prior to starting work; require attendance of affected installers; invite Architect and Owner.

B. Coordinate the product requirements, compatibility and installation activities of this Section with those of Section 09 9723 - Grafitti Coatings.

1.05 SUBMITTALS

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

B. Product Data: Provide product description, details of tests performed, limitations, chemical composition, and _____.

C. Manufacturer's Application Instructions: Indicate special procedures and conditions requiring special attention; cautionary procedures required during application.

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

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

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

1.07 MOCK-UPS

A. Prepare representative surface 36 by 36 inches (0.91 by 0.91 m) in size using specified materials and preparation and application methods on surfaces identical to those to be coated; approved mock-up constitutes standard for workmanship.

B. For proposed substitutions, prepare side-by-side mock-ups of specified and substitute products.

C. Locate where directed.

D. Mock-up may not remain as part of work.

1.08 FIELD CONDITIONS

A. Protect liquid materials from freezing.

B. Do not apply water repellent when ambient temperature is lower than 50 degrees F (10 degrees C) or higher than 100 degrees F (38 degrees C).

C. Do not apply water repellents when wind velocity exceeds manufacturer's recommendation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silane, Siloxane, Silane-Siloxane Blend, and Siliconate Water Repellents:
   1. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Water Repellent: Non-glossy, colorless, penetrating, water-vapor-permeable, non-yellowing sealer, that dries invisibly leaving appearance of substrate unchanged.
   1. Applications: Exterior, horizontal surfaces.
   2. Number of Coats: Two. Minimum As recommended by manufacturer.
   3. VOC Content: Less than 30 g/L, when tested in accordance with ASTM D3960 or ASTM D5095.
   4. Moisture Absorption When Applied to Masonry: Five percent, maximum, when tested in accordance with ASTM C140/C140M using masonry sample completely coated with water repellent.
   5. Moisture Absorption When Applied to Concrete: Five percent, maximum, when tested in accordance with ASTM C642 concrete sample completely coated with water repellent.
   6. Maintains dry appearance when wetted.
   7. Water-based, fluorinated, siloxane, silane, or blend that reacts chemically with concrete and masonry.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify joint sealants are installed and cured.

C. Verify surfaces to be coated are dry, clean, and free of efflorescence, oil, or other matter detrimental to application of water repellent.

3.02 PREPARATION

A. Protection of Adjacent Work:
   1. Protect adjacent landscaping, property, and vehicles from drips and overspray.
   2. Protect adjacent surfaces not intended to receive water repellent.

B. Prepare surfaces to be coated as recommended by water repellent manufacturer for best results.

C. Do not start work until masonry mortar substrate is cured a minimum of 60 days.

D. Remove loose particles and foreign matter.

E. Remove oil and foreign substances with a chemical solvent that will not affect water repellent.

F. Scrub and rinse surfaces with water and let dry.

G. Allow surfaces to dry completely to degree recommended by water repellent manufacturer before starting coating work.

3.03 APPLICATION

A. Apply water repellent in accordance with manufacturer's instructions, using procedures and application methods recommended as producing the best results.

B. Apply at rate recommended by manufacturer, continuously over entire surface.

C. Apply two coats, minimum.

D. Remove water repellent from unintended surfaces immediately by a method instructed by water repellent manufacturer.

END OF SECTION 071900

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SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, over roof sheathing, and exterior wall behind Cementitious Siding and stone wall finish.

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

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

B. Section 072600 - Vapor Retarders: Separate vapor retarder materials.

C. Section 072700 - Air Barriers: Separate air barrier materials.

1.03 REFERENCE STANDARDS

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

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

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

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

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

F. ASTM E2357 - Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies; 2025.

1.04 SUBMITTALS

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

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

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

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

E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

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.

1.05 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.

1.06 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 APPLICATIONS

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

B. Insulation Over Wood Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board.

C. Insulation in Wood Framed Walls: Batt insulation with integral vapor retarder.

D. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

E. Insulation Over Roof Deck: Polyisocyanurate board.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Comply with ASTM C578 with natural skin surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value (RSI-value): Type IV, 5.0 (0.88), minimum, per 1 inch (25.4 mm) thickness at 75 degrees F (24 degrees C) mean temperature.
   5. Products:
      a. DuPont de Nemours, Inc; Styrofoam Brand _____: building.dupont.com/#sle.
      b. Kingspan Insulation LLC; GreenGuard GG25-LG XPS Insulation Board: www.kingspan.com/#sle.
      c. Owens Corning Corporation; FOAMULAR Type _____ Extruded Polystyrene (XPS) Insulation: www.owenscorning.com/en-us/#sle.

B. Polyisocyanurate (ISO) Board Insulation: Rigid cellular foam, comply with ASTM C1289.
   1. Classifications:
      a. Type II: Faced with either cellulosic facers or glass fiber mat facers on both major surfaces of the core foam.
         1) Class 1 - Faced with glass fiber reinforced cellulosic facers on both major surfaces of core foam.
   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. Board Size: 48 inch by 96 inch (1220 mm by 2440 mm).
   5. Products:
      a. GAF; EnergyGuard Polyiso Insulation: www.gaf.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

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: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Formaldehyde Content: Zero.
   5. Thermal Resistance: R-value (RSI-value) of 21 (____), minimum.
   6. Facing: Asphalt treated mesh reinforced Kraft paper, one side.
   7. Products:
      a. CertainTeed Corporation: www.certainteed.com.
      b. Johns Manville: www.jm.com.

c. Knauf Insulation: www.knaufinsulation.com/#sle.
d. Owens Corning Corporation: www.owenscorning.com/en-us/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

B. Mineral Wool Blanket Thermal Insulation: Flexible or semi-rigid preformed insulation, complying with ASTM C665.
1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
3. Provide Class 1 or Class II interior vapor retarder - asphalt treated kraft paper or smart vapor retarders.
4. Thickness: 3.5 inch (__ mm).
5. Products:
a. Johns Manville: www.jm.com/#sle.
b. ROCKWOOL; Comfortboard 80: www.rockwool.com/#sle.
c. Thermafiber, Inc: www.thermafiber.com/#sle.
d. Substitutions: See Section 016000 - Product Requirements.

2.04 ACCESSORIES

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

B. Self-Adhered Transition Flashing: Multipurpose, self-adhered flashing with modified butyl adhesive, polyester fiber top sheet, and polypropylene interlayer.
1. Application: Primerless adhesion for use as through-wall flashings and wall transitions to roof and below-grade systems.
2. Thickness: 45 mil, 0.045 inch (1.14 mm), nominal.
3. Size: 6 inches (152 mm) wide, in rolls 75 feet (23 m) long.

C. Flashing Tape: Special reinforced film with high performance adhesive.
1. Application: Window and door opening flashing tape.
2. Width: As required for application.
3. Products:
a. Rmax Inc; R-SEAL 6000: www.rmax.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

D. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
1. Width: 5-1/2 inches (140 mm).
2. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to 30 days of weather exposure.

E. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch (50 mm) wide.
1. Products:
a. Rmax Inc; R-SEAL 3000: www.rmax.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

F. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

G. Support for Cladding and Continuous Insulation: Continuous thermal Z-girts.
1. Fiberglass reinforced plastic (FRP) girts that provide cladding attachment support for exterior wall cladding and siding.
2. Depth: As required for thickness of insulation.
3. Spacing: 16 inches (406 mm) on center, vertically.
4. Fasteners: As recommended by clip manufacturer.
5. Products:
a. Advanced Architectural Products, LLC; SMARTci: www.greengirt.com/#sle.

b. Substitutions: See Section 016000 - Product Requirements.

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

I. Protection Board for Below Grade Insulation: Cementitious, 1/4 inch (6 mm) thick.

J. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

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

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

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

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

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

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

3.03 BOARD INSTALLATION AT EXTERIOR WALLS

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

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

3.04 BOARD INSTALLATION USING CLADDING AND CONTINUOUS INSULATION SUPPORTS

A. Install supports in accordance with manufacturer's installation instructions.

B. Install supports in compliance with system orientation, sizes, and locations as indicated on drawings and in accordance with approved shop drawings.

C. Install supports to fill in exterior wall spaces without gaps or voids in insulation.

D. Trim insulation neatly to fit spaces and provide a continuous thermal layer.

3.05 BOARD INSTALLATION OVER LOW SLOPE ROOF DECK

A. Board Installation Over Roof Deck, General:
1. See applicable roofing specification section for specific board installation requirements.
2. Ensure vapor retarder is clean and dry, continuous, and ready for application of roofing system.
3. Fasten insulation to deck in accordance with roofing manufacturer's written instructions and applicable Factory Mutual requirements.
4. Do not apply more insulation than can be covered with roofing on the same day.

3.06 BATT INSTALLATION

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

B. Install in exterior wall 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. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

F. Tape seal tears or cuts in vapor retarder.

G. 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.

H. Coordinate work of this section with requirements for vapor retarder, see Section 072600.

I. Coordinate work of this section with construction of air barrier seal, see Section 072700.

3.07 PROTECTION

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

END OF SECTION 072100

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SECTION 072500
WEATHER BARRIERS

PART 2 PRODUCTS

END OF SECTION 072500

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SECTION 072600
VAPOR RETARDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vapor retarders.

1.02 DEFINITIONS

A. Vapor Retarder: Airtight barrier made of material that is relatively water vapor impermeable, to degree specified, with seams and joints sealed to adjacent surfaces.

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

1.03 REFERENCE STANDARDS

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

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

PART 2 PRODUCTS

END OF SECTION 072600

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SECTION 072700
AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air barriers.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016 (Reapproved 2021).

B. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds; 1998 (Reapproved 2025).

C. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.

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

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

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

G. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials; 2017, with Editorial Revision (2021).

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

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air Barrier, Fluid-Applied: Vapor semipermeable, elastomeric waterproofing.
   1. Air Barrier Coating and functions as a Water-Resistive Barrier (WRB) system.
      a. Air Permeance: 0.004 cfm/sq ft (0.02 L/(s sq m)), maximum, when tested in accordance with ASTM E2178.
      b. Water Vapor Permeance: 11 perms (629 ng/(Pa s sq m)), minimum, when tested in accordance with ASTM E96/E96M using Procedure B - Water Method, at 73.4 degrees F (23 degrees C).
      c. 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. Comply with NFPA 285 requirements for wall assembly.
      e. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
      f. VOC Content: Zero.
      g. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
      h. Products:
         1) DuPont de Nemours, Inc; Tyvek Fluid Applied WB+ with Tyvek Fluid Applied Flashing and Joint Compound, Sealant for Tyvek Fluid Applied System, and StraightFlash: building.dupont.com/#sle.
         2) Henry, a Carlisle Company; Air-Bloc All Weather STPE: www.henry.com/#sle.
         3) Master Builders Solutions; MasterSeal AWB 660: www.master-builders-solutions/en-us/#sle.
         4) Pecora Corporation; Pecora ProPerm VP - Vapor Permeable Air Barrier System with XL-Flash Liquid Flashing and Joint Filler, AVB Silicone Surface Transitions, and XL-Span Transition Membrane: www.pecora.com/#sle.
         5) PROSOCO, Inc; R-GUARD Spray Wrap MVP: www.prosoco.com/r-guard/#sle.

6) Siplast; WALLcontrol Liquid Applied Air and Water Barrier System: www.siplast.com/#sle.
7) Soprema, Inc; SOPRASEAL LM 204 VP: www.soprema.us/#sle.
8) W. R. Meadows, Inc; Air-Shield TMP: www.wrmeadows.com/#sle.
9) Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch (0.76 to 1.02 mm), nominal thickness.
2. Color: Green.
3. Elongation: 1,300 percent, measured in accordance with ASTM D412.
4. Peel Adhesion: 28 lb/inch (5.0 kg/cm), minimum, when tested in accordance with ASTM D903.
5. Comply with NFPA 285 requirements for wall assembly.

C. Primer: Liquid applied polymer.
1. Color: Green.
2. Elongation: 1,300 percent, measured in accordance with ASTM D412.

D. Composite Through-Wall Flexible Flashing: Membrane consisting of self-adhered rubberized asphalt laminated to a smooth surface, cross-laminated, high-density polyethylene film. Removable siliconized release liner prevents material from sticking together before application.
1. Thickness: 40 mils, 0.04 inch (1.02 mm).
2. Roll Size: 100 feet (30.5 m) long by 12 inches (305 mm) wide.

E. Flexible Flashing: Self-adhesive sheet flashing.
1. Comply with ICC-ES AC148.
2. Width: 4 inches (100 mm).
3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.
4. Products:
a. Henry, a Carlisle Company; FortiFlash: www.henry.com/#sle.
b. Henry, a Carlisle Company; FortiFlex Butyl: www.henry.com/#sle.
c. Henry, a Carlisle Company; FortiFlash Butyl: www.henry.com/#sle.
d. W. R. Meadows, Inc; Air-Shield Butyl Flashing: www.wrmeadows.com/#sle.
e. Substitutions: See Section 016000 - Product Requirements.

F. Threshold Flashing: Closed-cell foam tape with rubberized adhesive membrane; seals subfloor under threshold.
1. Width: 5-1/2 inches (140 mm).
2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.

G. Flashing Tape for Nonflanged Openings: Polypropylene face with copolymer adhesive and release liner.

H. Thinners and Cleaners: As recommended by material manufacturer.

I. Air and Moisture Sealing Insulation Fasteners: Preassembled fastener units consisting of sealing washer, screw, and gasketing tube.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready for work of this section.

B. Where existing conditions are responsibility of another installer, notify Architect of unsatisfactory conditions.

C. Do not proceed with this work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives and sealants in accordance with manufacturer's installation instructions.

3.03 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Fluid-Applied Coatings or Membranes:
   1. Prepare substrate in accordance with manufacturer's installation instructions; treat joints in substrate and between dissimilar materials as indicated.
   2. Where exterior masonry veneer is being installed, install masonry anchors before installing air barrier over masonry; provide airtight seal around anchors.
   3. Apply bead or trowel coat of mastic sealant with minimum thickness of 1/4 inch (6 mm) along coating seams, rough cuts, and as recommended by manufacturer.
   4. Use flashing to seal to adjacent construction and to bridge joints in coating substrate.

E. Openings and Penetrations in Exterior Air Barriers:
   1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches (125 mm) onto air barrier and at least 6 inches (150 mm) up jambs; mechanically fasten stretched edges.
   2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches (100 mm) wide; do not seal sill flange.
   3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches (230 mm) wide, and covering entire depth of framing.
   4. At head of openings, install flashing under air barrier extending at least 2 inches (50 mm) beyond face of jambs; seal air barrier to flashing.
   5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
   6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements

B. Owner will provide testing services, and Contractor to provide temporary construction and materials for testing.

C. Do not cover installed air barriers until required inspections have been completed.

D. Obtain approval of installation procedures from air barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.05 PROTECTION

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

END OF SECTION 072700

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SECTION 074113
METAL ROOF PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural roofing system of preformed steel panels.

B. Thermal roof insulation.

C. Attachment system.

D. Finishes.

E. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Roof sheathing.

B. Section 072100 - Thermal Insulation: Rigid roof insulation.

C. Section 07 6200- Sheet Metal Flashing and Trim: Snow Guards.

D. Section 079200 - Joint Sealants: Sealing joints between metal roof panel system and adjacent construction.

1.03 REFERENCE STANDARDS

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

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

C. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2025a.

D. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus; 2024.

E. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2025.

F. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference; 2025.

G. IAS AC472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems; 2024, with Editorial Revision (2025).

H. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Current Edition, Including All Revisions.

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. Summary of test results, indicating compliance with specified requirements.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Specimen warranty.

C. Shop Drawings: Include layouts of roof panels, details of edge and penetration conditions, spacing and type of connections, flashings, underlayments, and special conditions.
   1. Show work to be field-fabricated or field-assembled.
   2. Indicate thickness and dimensions of parts, fastenings and anchoring methods, details and locations of joints, transitions and other provisions necessary for thermal expansion and contraction.
   3. Indicate locations of field- and factory-applied sealant.

D. Verification Samples: For each roofing system specified, submit samples of minimum size 12 inches (305 mm) square, representing actual roofing metal, thickness, profile, color, and texture.
   1. Include typical panel joint in sample.
   2. Include typical fastening detail.

E. Manufacturer Qualification Statement: Provide documentation showing metal roof panel fabricator is accredited under IAS AC472.

F. Test Reports: Indicate compliance of metal roofing system to specified requirements.

G. Warranty: Submit specified manufacturer's warranty and ensure that forms have been completed in Owner's name and are registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of experience.
   1. Accredited by IAS in accordance with IAS AC472.

B. Installer Qualifications:
   1. Three years' experience, minimum, in application of metal roof or wall panels.
   2. Five satisfactory projects with metal panel work of similar scope and complexity to Work of this Project.
   3. Installer must be approved by manufacturer in writing prior to bid. Approval document must be included with project bid.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide strippable plastic protection on prefinished roofing panels for removal after installation.

B. Store roofing panels on project site as recommended by manufacturer to minimize damage to panels prior to installation.

C. Keep panels and accessory items dry.

D. Protect against damage and discoloration.

E. Handle panels with non-marring slings.

F. Support panels to prevent permanent deformation.

G. Store panels above ground, with one end elevated for drainage.

H. Protect panels against standing water and condensation between adjacent surfaces.

I. If panels become wet, immediately separate sheets, wipe dry with clean cloth, and keep sheets separate for air-drying.

J. Painted panels shall be shipped with protective plastic sheeting or a strippable film coating between panels. Remove strippable film coating prior to installation. Do not allow strippable film coating to remain on panels in extreme heat, cold, or direct sunlight or other UV source.

K. Do not allow panels to contact treated lumber.

1.07 WARRANTY

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

B. Manufacturer's Warranty: Manufacturer’s standard 25-year performance warranty, stating the following:
   1. Architectural fluorocarbon finish:
      a. Will be free of fading or color change in excess of 5 Hunter delta-E units as determined by ASTM D2244-02.
      b. Will not chalk in excess of numerical rating of 8 when measured in accordance with standard procedures specified in ASTM D4214-98 method D659.
      c. Will not peel, crack, chip, or delaminate.
   2. Metal substrate will not rupture, fail structurally, or perforate.

C. Installer's Warranty: Warrant panels, flashings, sealants, fasteners and accessories against defective materials and/or workmanship, covering repairs required to maintain roof panels watertight and weatherproof with normal usage for two years following Project Substantial Completion date.
   1. Furnish written warranty, signed by installer.

D. Weathertight Performance Warranty: Manufacturer's standard warranty in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weather tight within specified warranty period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Roof Panels:
   1. Basis of Design: AEP Span: www.aepspan.com. Match Existing.
      a. Span-Lok HP, 16" panel with two Pencil Ribs
   2. MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.; Houston TX. Tel: (877)713-6224; Email: info@mbci.com; Web: www.mbci.com.
   3. Taylor Metal Products; www.taylormetal.com/#sle
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 ARCHITECTURAL METAL ROOF PANELS

A. Architectural Metal Roofing: Provide complete engineered system complying with specified requirements and capable of remaining weathertight while withstanding anticipated movement of substrate and thermally induced movement of roofing system.

B. Metal Panels: Factory-formed panels with finish.
   1. Steel Panels conforming to ASTM A792:
      a. Aluminum-zinc alloy-coated steel conforming to ASTM A792/A792M; minimum AZ50 (AZM150) coating.
      b. Steel Thickness: Minimum 22 gage (.030 inch) (_____ mm).
   2. Profile: Standing seam, with minimum 2.0 inch (51 mm) seam height; concealed fastener system for field seaming with special tool.
   3. Texture: Smooth, with intermediate ribs for added stiffness.
   4. Width: Maximum panel coverage of 16 inches (406 mm).
   5. DuraTech® 5000: Polyvinylidine Fluoride, full 70 percent Kynar 500®or Hylar 5000®, consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 8 to 15 when tested in accordance with ASTM D523 at 60 degrees.
   6. Seam Sealant: Factory apply high-grade butyl mastic sealant within the confines of panel’s female leg, designed to seal against adjacent male panel leg.

C. Metal Soffit Panels
   1. Metal Soffit Panels:
   2. Profile: Flush with 2 pencil ribs, with venting not provided. uless necessary.
   3. Material: Precoated steel sheet, 22 gauge, 0.0299 inch (0.76 mm) minimum thickness.
   4. Color: As indicated.
   5. Manufacturer: Basis of Design: AEP SPAN Flush Panel with Pencil Ribs.
      a. Match existing building profile.
      b. Provide soffit material from metal roofing manufacturer.

2.03 ATTACHMENT SYSTEM

A. Concealed System: Provide manufacturer's standard stainless steel or nylon-coated aluminum concealed anchor clips designed for specific roofing system and engineered to meet performance requirements, including anticipated thermal movement.

B. Panel Clips: Provide panel clip of type specified, at spacing indicated on approved shop drawings.
   1. Provide clip designed to allow panels to thermally expand and contract. Clip shall incorporate a self-centering feature to allow 1 inch of movement in both directions along panel length. Clip type shall be selected to meet positive and negative pressures as specified.
      a. Sealant: Factory-installed sealant to provide continuity of seal at clip locations.

2.04 FABRICATION

A. Fabrication, General:
   1. Unless otherwise shown on Drawings or specified herein, fabricate panels in continuous lengths and fabricate flashings and accessories in longest practical lengths.
   2. Panels shall be factory correctively-leveled.

B. Panels:
   1. Provide panels in full length from ridge to eave when possible.
   2. Where single length panels are not practical, provide mated swaged panels for positive joint end laps, shingled to accommodate water run-off (fabricated with overlap in direction of water flow).
   3. Roof panels shall have flush horizontal and vertical surfaces to facilitate sealing at terminations. Panel configurations which create voids and requiring supplemental closure devices shall not be considered acceptable.
   4. Engineer panels to use concealed anchors that permit expansion and contraction, except at eaves, end laps, ridges, valleys, hips and gables.

C. Seams:
   1. Panel seams shall interlock entire length of seam.
   2. Design standing seam to lock up and resist joint disengagement during design wind uplift conditions as calculated according to local building codes.
   3. Provide pre-installed sealant within confines of panel's female leg to aid in resistance of leaks and provide panel-to-panel seal while allowing expansion and contraction movement.
   4. Seams shall be continuously locked or crimped together by mechanical means during installation. Seaming tools shall be sourced from manufacturer's recommended vendor.

D. Fabrication Tolerances:
   1. Flat metal surfaces will display waviness commonly referred to as "oil canning". This is caused by steel mill tolerances and is a characteristic, not a defect, of panels manufactured from light gauge metal. Panels are factory correctively-leveled to minimize the occurrence of "oil canning". As such, "oil canning" will not be accepted as cause for rejection.

2.05 FINISHES

A. DuraTech® 5000: Polyvinylidine Fluoride, full 70 percent Kynar 500®or Hylar 5000®, consisting of a baked-on 0.15-0.20 mil corrosion resistant primer and a baked-on 0.70-0.80 mil finish coat with a specular gloss of 8 to 15 when tested in accordance with ASTM D523 at 60 degrees.
   1. Color: Match Existing Building metal roof

2.06 ACCESSORIES

A. Miscellaneous Sheet Metal Items: Provide flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, and equipment curbs of the same material, thickness, and finish as used for the roofing panels. Items completely concealed after installation may optionally be made of stainless steel.
   1. Downspouts: Rectangular profile.

B. Rib and Ridge Closures: Provide prefabricated, close-fitting components of steel with corrosion resistant finish.

C. Sealants:

1. Exposed Sealant: Elastomeric; silicone, polyurethane, or silyl-terminated polyether/polyurethane.
2. Concealed Sealant: Non-curing butyl sealant or tape sealant.
3. Seam Sealant: Factory-applied, non-skinning, non-drying type.

D. Underlayment: Self-adhering rubber-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil (____ mm) total thickness; with strippable release film and woven polypropylene sheet top surface.
1. Material: Cold applied, self adhering membrane composed of an innovative and proprietary rubberized asphalt adhesive and interwound with a disposable release sheet. An embossed, slip resistant surface is provided on the high performance film with UV barrier properties.
2. Membrane Thickness: 40 mils (1.02 mm) per ASTM D3767 Method A.
3. Membrane Tensile Strength: MD 33 lbf/in, CD 31 lbf/inch per ASTM D412 Die C Modified.
4. Membrane Elongation: 250% per ASTM D412 Die C Modified.
5. Low Temperature Flexibility: Unaffected at -20 degrees F (-29 degrees C) per ASTM D1970.
6. Adhesion to Plywood: 5.0 lb/in. width (876 N/m) per ASTM D903.
7. Maximum Permeance: 0.05 perms (2.9 ng/sgms Pa) per ASTM E96.
8. Maximum Material Weight Installed: 0.22 pounds/sqft (1.1 kg/sqm) per ASTM D461.
9. Service Temperature: 260 degrees F (115.6 degrees C) per ASTM D1204
10. Compatibility: Suitable for use under all types of sloped roofing with the exception high altitude climates where zinc, copper or Cor-Ten roof coverings are used.
11. Adhesive: Rubberized asphalt adhesive containing post-consumer recycled content, contains no calcium carbonate, sand or fly ash.
12. Exposure: Can be left exposed for a maximum of 120 days from date of installation per ASTM G90 - EMMAqua test.
13. Primer: Water-based Perm-A-Barrier WB Primer by GCP Applied Technologies, Inc.
14. Manufacturers:
    a. GCP Applied Technologies, Inc., 62 Whittemore Avenue, Cambridge, MA 02140, Toll Free 866-333-3726, www.gcpat.com.
    b. Henry Company; Blueskin PE200HT: www.henry.com/#sle.
    c. Substitutions: See Section 016000 - Product Requirements.

E. Snow Guards:
1. Rail- or Bar-type.
2. Spacing, attachment and number of rows to be designed by Manufacturer's engineering department for the anticipated snow loads and depths.
3. Products:
    a. Basis of Design: S-5, "Colorgard" standing seam type snow fence, and "S-5-U" brackes.
    b. Substitutions: See section 01 6000 - Products Requirements.
4. Roofing manufacturer provide metal panels to match roof color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation of preformed metal roof panels until substrates have been properly prepared.

3.02 PREPARATION

A. Broom clean wood sheathing prior to installation of roofing system.

B. Coordinate roofing work with provisions for roof drainage, flashing, trim, penetrations, and other adjoining work to assure that the completed roof will be free of leaks.

C. Coordinate installation of waterproof membrane over roof sheathing with 061000.

D. Remove protective film from surface of roof panels immediately prior to installation. Strip film carefully, to avoid damage to prefinished surfaces.

E. Separate dissimilar metals by applying a bituminous coating, self-adhering rubberized asphalt sheet, or other permanent method approved by roof panel manufacturer.

F. Where metal will be in contact with wood or other absorbent material subject to wetting, seal joints with sealing compound and apply one coat of heavy-bodied bituminous paint.

3.03 INSTALLATION

A. Overall: Install roofing system in accordance with approved shop drawings and panel manufacturer's instructions and recommendations, as applicable to specific project conditions. Anchor all components of roofing system securely in place while allowing for thermal and structural movement.
   1. Install roofing system with concealed clips and fasteners, except as otherwise recommended by manufacturer for specific circumstances.
   2. Minimize field cutting of panels. Where field cutting is absolutely required, use methods that will not distort panel profiles. Use of torches for field cutting is absolutely prohibited.

B. Accessories: Install all components required for a complete roofing assembly, including flashings, gutters, downspouts, trim, moldings, closure strips, preformed crickets, caps, equipment curbs, rib closures, ridge closures, and similar roof accessory items.

C. Roof Panels: Install panels in strict accordance with manufacturer's instructions, minimizing transverse joints except at junction with penetrations.
   1. Form weathertight standing seams incorporating concealed clips, using an automatic mechanical seaming device approved by the panel manufacturer.
   2. Install sealant or sealant tape, as recommended by panel manufacturer, at end laps and side joints.
   3. Coordinate installation of and supports for fall restraint devices with installation of roofing.

3.04 CLEANING

A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving the work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to the finish.

3.05 PROTECTION

A. Do not permit storage of materials or roof traffic on installed roof panels. Provide temporary walkways or planks as necessary to avoid damage to completed work. Protect roofing until completion of project.

B. Touch-up, repair, or replace damaged roof panels or accessories before Date of Substantial Completion.

END OF SECTION 074113

SECTION 074646
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Siding substrate.

B. Section 072500 - Weather Barriers: Water-resistive barrier under siding.

C. Section 079200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

D. Section 099113 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets; 2026.

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. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

C. Installer's qualification statement.

D. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

E. Warranty: Submit copy of manufacturer’s warranty, made out in Owner’s name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of type specified in this section with not less than three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

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

B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

1.07 WARRANTY

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

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Style: Standard lap style.
   2. Texture: Smooth
   3. Length: 12 feet (3.7 m), nominal.
   4. Width (Height): 7-1/4 inches (184 mm), 6 inches exposure.

5. Thickness: 5/16 inch (8 mm), nominal.
6. Finish: Factory applied stain.
7. Color: As selected by Architect from manufacturers full range of available colors.
8. Warranty: 30 year limited; <>.
9. Products:
    a. Basis of Design: James Hardie Building Products, Inc; HZ-5: www.jameshardie.com.
    b. Allura, a division of Plycem USA, Inc; _____: www.allurausa.com/#sle.
    c. Nichiha USA, Inc; _____: www.nichiha.com/#sle.
    d. Substitutions: See Section 016000 - Product Requirements.

B. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186 Type A Grade II; with machined edges, for nail attachment.
1. Texture: Smooth with battens.
2. Thickness: 5/16 inch (8 mm), nominal.
3. Color: As selected by Architect from manufacturers full range of available colors.
4. Products:
    a. Basis of Design: James Hardie Building Products, Inc: www.jameshardie.com.
    b. Allura, a division of Plycem USA, Inc; _____: www.allurausa.com/#sle.
    c. Nichiha USA, Inc; _____: www.nichiha.com/#sle.
    d. Substitutions: See Section 016000 - Product Requirements.

2.02 ACCESSORIES

A. Trim: Same material and texture as siding.

B. Batten Boards: Same material and texture as siding.

C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches (31.8 mm), minimum.

D. Primer: Apply primer, acceptable to siding manufacturer, to all field-cut edges.

E. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

F. Finish Paint: Exterior latex paint acceptable to siding manufacturer; primer recommended by paint manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistant barrier has been installed over substrate completely and correctly; see Section 054000.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

A. Protect surrounding areas and adjacent surfaces during execution of this work.

B. Install Sheet Metal Flashing:
1. Above door and window trim and casings.
2. Above horizontal trim in field of siding.

3.03 INSTALLATION

A. Install siding in accordance with manufacturer's instructions and recommendations.
1. Read warranty and comply with terms necessary to maintain warranty coverage.

2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
3. Use trim details as indicated on drawings.
4. Seal all field cut edges before installing or painting.
5. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood Sheathing: Fasten siding through sheathing into studs.

C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with manufacturer's recommended paintable sealant.

D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

E. Do not install siding less than 6 inches (150 mm) from surface of ground nor closer than 1 inch (25 mm) to roofs, patios, walks, porches, and other surfaces where water may collect.

F. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Prime and paint all exposed cut edges.

G. Finish Painting: See Section 099113.

3.04 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 074646

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SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

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

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Downspout Boots

B. Section 077123 - Manufactured Gutters and Downspouts.

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

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

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

1.04 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.

C. Samples: Submit two samples 4 x 4 inch (____x____ mm) in size illustrating metal material and finish color.

1.05 QUALITY ASSURANCE

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

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

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

PART 2 PRODUCTS

2.01 SHEET MATERIALS

2.02 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet, minimum 4 inches (____ mm) wide, spaced at 2'-0" o.c., interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch (13 mm); miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18-inch (450 mm) long legs; seam for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer Type: Zinc chromate.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

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

F. Reglets: Surface-mounted type, galvanized steel; face and ends covered with plastic tape.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, 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. Insert flashings into reglets to form tight fit; secure in place with lead wedges; pack remaining spaces with lead wool; seal flashings into reglets with sealant.

B. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted.

C. Apply plastic cement compound between metal flashings and felt flashings.

D. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

E. Seal metal joints watertight.

END OF SECTION 076200

SECTION 077123
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished galvanized steel gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Downspout boots.

B. Section 076200 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

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

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

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, or abrasion and to provide ventilation. Slope to drain.

C. Prevent contact with materials that cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:
   1. MBCI Metal Roof and Wall Systems, Division of NCI Group, Inc.; Houston TX. Tel: (877)713-6224; Email: info@mbci.com; Web: www.mbci.com
   2. ATAS International, Inc: www.atas.com/#sle.
   3. Cheney Flashing Company: www.cheneyflashing.com/#sle.
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 GUTTERS AND DOWNSPOUTS

A. Gutters: SMACNA rectangular style profile. Min. 6: gutters and Min. 4" downspouts. Match existing building shape, size and color.

B. Downspouts: SMACNA Rectangular profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.
   1. Anchoring Devices: Type recommended by manufacturer.

2.03 ACCESSORIES

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify surfaces are acceptable for product installation in accordance with manufacturer's written instructions.

3.02 INSTALLATION

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Slope gutters 1/8 inch per 10 foot, minimum.

C. Connect downspouts to downspout boots at 6 inches (____ mm) above grade. Grout connection watertight.

D. Connect downspouts to storm sewer system. Grout connection watertight.

END OF SECTION 077123

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof curbs.

B. Roof penetrations mounting curbs.

C. Roof snow and ice melting system.

1.02 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 A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

D. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2025a.

E. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2025.

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.
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
   4. Maintenance requirements.

C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
   1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.

D. Warranty Documentation:
   1. Submit manufacturer warranty.
   2. Ensure that forms have been completed in Owner's name and registered with manufacturer.
   3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

1.05 WARRANTY

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

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for weather tightness. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 ROOF CURBS

A. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and

designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.

1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings.
2. Roof Curb Mounting Substrate: Curb substrate consists of standing seam metal roof panel system.
3. Galvanized Steel: Hot-dip zinc coated steel sheet complying with ASTM A653/A653M, SS Grade 33 (230); G60 (Z180) coating designation; 18 gauge, 0.048 inch (1.21 mm) thick.
   a. Color: Match adjacent metal roof color.
4. Roofing Cants: Provide integral sheet metal roofing cants dimensioned to begin slope at top of roofing system at 1:1 slope; minimum cant height 4 inches (102 mm).
5. Fabricate curb bottom and mounting flanges for installation directly on metal roof panel system to match slope and configuration of system.
   a. Extend side flange to next adjacent roof panel seam and comply with seam configurations and seal connection, providing at least 6 inch (152 mm) clearance between curb and metal roof panel flange allowing water to properly flow past curb.
   b. Where side of curb aligns with metal roof panel flange, attach fasteners on upper slope of flange to curb connection allowing water to flow past below fasteners, and seal connection.
   c. Maintain at least 12 inch (305 mm) clearance from curb, and lap upper curb flange on underside of down sloping metal roof panel, and seal connection.
   d. Lap lower curb flange overtop of down sloping metal roof panel and seal connection.

B. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches (400 mm) square unless otherwise indicated.
   1. Provide sliding channel welded along top edge with adjustable height steel bracket, fabricated to fit item supported.

2.02 PENETRATING ROOFTOP ASSEMBLIES

A. Fall Restraint Devices:
   1. Anchors for Membrane Roofs. OSHA compliant anchors to be designed by Manufacturer's engineering department for the anticipated loads.
   2. Location: As indicated on drawings.
   3. Products:
      a. Basis of Design: Sala roof top ancor for PVC roofs, Model 2100140; www.dbifallprotection.com
      b. Substitutions: See section 01 6000 - Products Requirements.

B. Pipe Supports: Provide attachment fixtures complying with MSS SP-58 and as indicated.
   1. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
   2. See relevant piping system specification section for additional requirements.

2.03 ROOF SNOW AND ICE MELTING SYSTEMS

A. Roof Snow and Ice Melting Systems: Self-regulating heating cable system for roof and gutter applications to melt snow and ice.
   1. Application: Standing seam metal roofing system with gutter.
   2. Provide cable spacing and number of heating circuits and accessories in accordance with manufacturer's written requirements.
   3. Supply Voltage: 110-120 VAC with ground-fault protection as required by authorities having jurisdiction (AHJ).
   4. SEE ELECTRICAL DRAWINGS AND SPECIFICATIONS

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.

B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.04 CLEANING

A. Clean installed work to like-new condition.

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 077200

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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 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 017000 - Execution and Closeout Requirements: Cutting and patching.

C. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing and top-of-wall joints.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2026.

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

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

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

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

1.04 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.

F. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.
   2. Verification of minimum three years documented experience installing work of this type.
   3. Verification of at least five satisfactorily completed projects of comparable size and type.

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Manufacturers:
   1. A/D Fire Protection Systems Inc.: www.adfire.com.
   2. 3M Fire Protection Products: www.3m.com/firestop.
   3. Hilti

B. Firestopping Materials: Any materials meeting requirements.

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

D. Fire Ratings: Refer to drawings for required systems and ratings.

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

A. Gypsum Board Walls:
   1. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
      a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
      b. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.

2.03 FIRESTOPPING PENETRATIONS THROUGH CONCRETE MASONRY CONSTRUCTION

A. Penetrations Through Walls By:
   1. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   2. Insulated Pipes:
      a. 1 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   3. HVAC Ducts, Uninsulated:
      a. 2 Hour Construction: UL System W-J-7109; Hilti FS-ONE MAX Intumescent Firestop Sealant, or CP 606 Flexible Firestop Sealant.
   4. HVAC Ducts, Insulated:
      a. 2 Hour Construction: UL System W-J-7112; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.04 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:
   1. 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
   2. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

B. Penetrations By:
   1. Multiple Penetrations in Large Openings:
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 1 Hour Construction: UL System W-L-1506; Hilti CFS-D Firestop Cable Disc.
   3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
      b. 1 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
   4. Electrical Cables Not In Conduit:
      a. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
      b. 1 Hour Construction: UL System W-L-3414; Hilti CFS-D Firestop Cable Disc.

5. Cable Trays with Electrical Cables:
    a. 2 Hour Construction: UL System W-L-4011; Hilti CFS-BL Firestop Block.
    b. 1 Hour Construction: UL System W-L-4011; Hilti CFS-BL Firestop Block.
6. Insulated Pipes:
    a. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
    b. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
7. HVAC Ducts, Insulated:
    a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    b. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.05 FIRESTOPPING SYSTEMS

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

PART 3 EXECUTION

3.01 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.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

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

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 078400

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SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Self-leveling pourable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

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

B. Section 079100 - Preformed Joint Seals: Precompressed foam, gaskets, and strip seals.

C. Section 092116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

D. Section 093000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

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 C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2024.

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

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

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

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

H. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2015 (Reapproved 2021).

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. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.
   5. Substrates for which use of primer is required.
   6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
   7. Sample product warranty.

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. Installation Plan: Submit at least four weeks prior to start of installation.

H. Installation Log: Submit filled-out log for each length or instance of sealant installed.

I. 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.

J. Executed warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. 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.

D. Installation Plan: Include schedule of sealed joints, including the following:
   1. Installation Log Form: Include the following data fields, with known information filled out.
      a. Location on project.
      b. Substrates.
      c. Sealant used.
      d. Stated movement capability of sealant.
      e. Primer to be used, or indicate no primer is used.
      f. Size and actual backing material used.
      g. Date of installation.
      h. Name of installer.
      i. Actual joint width; provide space to indicate maximum and minimum width.
      j. Actual joint depth to face of backing material at centerline of joint.
      k. Air temperature.

E. 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.

F. 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. For each different sealant and substrate combination, allow for one test every 12 inches (305 mm) in the first 10 linear feet (3 linear m) of joint and one test every 24 inches (610 mm) thereafter.

b. If any failures occur in the first 10 linear feet (3 linear m), continue testing at 12 inches (305 mm) intervals at no extra cost to Owner.

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.

G. 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.

H. Nondestructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Spot Method.
1. Record results on Field Quality Control Log.
2. Repair failed portions of joints.

I. 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.

J. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or another applicable method as recommended by manufacturer.

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. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
2. Bostik Inc; _____: www.bostik-us.com/#sle.
3. Dow; _____: www.dow.com/#sle.

4. Tremco Global Sealants: www.tremcosealants.com.
5. Sika Corporation; _____: usa.sika.com/#sle.
6. Tremco Commercial Sealants & Waterproofing; ____: www.tremcosealants.com/#sle.
7. W.R. Meadows, Inc: www.wrmeadows.com/sle.

B. Self-Leveling Sealants:
1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
2. Bostik Inc; _____: www.bostik-us.com/#sle.
3. Dow; _____: www.dow.com/#sle.
4. Tremco Global Sealants: www.tremcosealants.com.
5. Sika Corporation; _____: usa.sika.com/#sle.
6. Tremco Commercial Sealants & Waterproofing; ____: www.tremcosealants.com/#sle.
7. W.R. Meadows, Inc: www.wrmeadows.com/sle.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
2. Lap Joints between Manufactured Metal Panels: Butyl rubber, non-curing.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
3. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
4. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
5. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
6. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.

D. Interior Wet Areas: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as STC-rated, sound-rated, or acoustical.

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 SELF-LEVELING JOINT SEALANTS

A. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.
1. Composition: Multicomponent, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.
4. Joint Width, Minimum: 1/8 inch (3 mm).
5. Joint Width, Maximum: 1/4 inch (6 mm).
6. Joint Depth: Provide product suitable for joints from 1/8 inch (3 mm) to 2 inches (51 mm) in depth including space for backer rod.
7. Products:
a. Dayton Superior Corporation; _____: www.daytonsuperior.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

2.05 ACCESSORIES

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

B. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

C. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

D. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

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

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. 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.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

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

B. Perform field quality control inspection/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.

3.05 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width, i.e., at low temperature in thermal cycle. Report failures immediately and repair them.

END OF SECTION 079200

SECTION 079513
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing expansion and control joints using gunnable and pourable sealants.

B. Section 092116 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

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

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

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

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

1.04 SUBMITTALS

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

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

D. Samples: Submit two samples ____ inch long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Expansion Joint Cover Assemblies:
   1. Sika Emseal: www.emseal.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Interior Floor Joints Subject to Seismic Movement:
   1. Manufacturers:

B. Interior Non-Fire-Rated Wall/Ceiling Joints Subject to Seismic Movement:

C. Interior Fire-Rated Wall/Ceiling Joints Subject to Seismic Movement:

D. Exterior Wall Joints Subject to Seismic Movement:

E. Exterior Roof Bellows with Metal Flange Expansion Joint Covers:

2.03 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
   1. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
   2. Joint Movement Capability: If not indicated, provide minimum plus/minus 25 percent joint movement capability.
   3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
   4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

B. Floor Joint Covers: Coordinate with indicated floor coverings.

C. Resilient Seal Type Covers: Having flat exposed surface without crevices that could collect dirt; designed to withstand expected movement without extrusion of seal from joint assembly; for floors, provide style that is flush with top of floor covering; for exterior joints, weathertight.

D. Covers in Gypsum Board Assemblies: Provide style with anchoring wings that can be completely covered by joint compound.

E. Covers in Fire Rated Assemblies: Provide cover assembly having fire rating equivalent to that of assembly into which it is installed.
   1. Acceptable Evaluation Agencies: UL (DIR) and ITS (DIR).

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
   1. Exposed Finish Outdoors: Natural anodized.
   2. Exposed Finish at Floors: Mill finish or natural anodized.
   3. Exposed Finish at Walls and Ceilings: Natural anodized.

B. Resilient Seals:
   1. For Ceilings: Any resilient material, flush, pleated, or hollow gasket.

C. Anchors and Fasteners: As recommended by cover manufacturer.

D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

2.05 ACCESSORIES

A. Resilient Fire Barrier: For use with metal expansion joint covers and elastomeric seals, with fire rating in accordance with surrounding construction performance capabilities.
   1. Application: Roof to Wall, Wall to Roof, Wall to Wall, Floor to Floor.
   2. Fire Resistance Rating: 2-hour, in accordance with ASTM E1966 and UL 2079.

END OF SECTION 079513

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Fire-rated hollow metal doors and frames.

D. Thermally insulated hollow metal doors with frames.

E. Sound-rated hollow metal doors and frames.

F. Hollow metal borrowed lites glazing frames.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware.

B. Section 088000 - Glazing.

C. Section 099113 - Exterior Painting.

D. Section 099123 - Interior Painting.

1.03 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NAAMM: National Association of Architectural Metal Manufacturers.

D. NFPA: National Fire Protection Association.

E. SDI: Steel Door Institute.

F. UL: Underwriters Laboratories.

1.04 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2026.

C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2023.

D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2025.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

F. 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; 2026.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2025.

H. ASTM C143/C143M - Standard Test Method for Slump of Concrete; 2026b.

I. ASTM C476 - Standard Specification for Grout for Masonry; 2023.

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

K. BHMA A156.115 - Hardware Preparation in Steel Doors and Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

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

N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2024.

P. NAAMM HMMA 840 - Guide Specifications for Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2024.

Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

R. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

S. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2026.

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.

X. UL 1784 - Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives; 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. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum ten (10) years documented experience.
   1. Provide hollow metal frames from SDI Certified manufacturer.

B. Maintain at project site copies of reference standards relating to installation of products specified.

1.07 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 Exterior Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group Company; C or CM Series Frames and 777E - Trio-E insulated doors: www.curries.com.
   3. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
   4. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   5. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   6. Steelcraft, an Allegion brand: www.allegion.com/sle.

7. 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: Flush.
   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 .
      b. Physical Performance ; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 mm) 20 gauge, 0.032 inch (0.8 mm), minimum.
      e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
   2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
      a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.
   3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
   4. Door Thermal Resistance: U-value of 0.40, maximum.
   5. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
   6. Weatherstripping: See Section 087100.
   7. Door Finish: Factory primed and field finished.

C. Interior Doors, Non-Fire Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty, unless otherwise noted.
      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: 20 gauge, 0.032 inch (0.8 mm) 20 gauge, 0.032 inch (0.8 mm), minimum.

2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.
4. Door Finish: Factory primed and field finished.

D. Fire-Rated Doors:
1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
a. Level .
b. Physical Performance ; in accordance with ANSI/SDI A250.4.
c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 20 gauge, 0.032 inch (0.8 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. Smoke and Draft Control Doors: Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
a. Maximum Air Leakage: 3.0 cfm/sq ft (0.02 cu m/sec/sq m) of door opening at 0.10 inch w.g. (24.9 Pa) pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
c. Label: Include the "S" label on fire-rating label of door.
5. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
6. 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. 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 gage, 0.053 inch (1.3 mm), minimum.
3. Frame Finish: Factory primed and field finished.
4. Weatherstripping: See Section 087100.
5. Grouting: Provide mortar guard boxes for hardware cut-outs in exterior frames.
a. Provide grouting access to both vertical and horizontal mullions, where they occur.
6. Provide bituminous coating on interior of all frames prior to installation.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
2. Frame Finish: Factory primed and field finished.
3. Internal Coating: Provide sound deadening coating on interior surface of all interior door frames.
4. Insulation: fill gap between frame and rough-opening with non- or low-expanding foam.

D. Door Frames, Fire-Rated: Full profile/continuously welded type.
1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
3. Frame Finish: Factory primed and field finished.
4. Grout: Fully grouted frames.

E. Sound-Rated Door Frames: Full profile/continuously welded type.
   1. Frame Metal Thickness: 16 gage, 0.053 inch (1.3 mm), minimum.
   2. Frame Finish: Factory primed and field finished.
   3. Grout: Fully grouted frames.

F. Frames for Wood Doors: Frame metal thickness same as for flush metal interior doors. Comply with frame requirements in accordance with corresponding door.

G. Mullions for Pairs of Doors: Removable type, with profile similar to jambs.

H. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

I. Transom Bars: Fixed, of profile same as jamb and head.

J. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.

2.05 FINISHES

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

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch (0.4 mm) dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
   1. Fire-Rated Frames: Comply with fire rating requirements indicated.

2.06 ACCESSORIES

A. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
   1. Style: Sightproof inverted V blade.
   2. Louver Free Area: 50 percent.
   3. Fasteners: Concealed fasteners.

B. Glazing: As specified in Section 088000, factory installed.

C. Removable Stops: Formed sheet steel, mitered corners; prepared for countersink style tamper proof screws.

D. Mullions for Pairs of Doors: Removable type, with profile similar to jambs.

E. Astragals for Double Doors:
   1. Fire-Rated Doors: Steel, shape as required for fire rating.

F. 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.

G. 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.

H. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 PREPARATION

A. Coat inside of frames to be installed in exterior walls 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 exterior walls, 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.

F. Coordinate installation of electrical connections to electrical hardware items.

G. 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 081113

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames.

B. Section 087100 - Door Hardware.

C. Section 088000 - Glazing.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

C. ASTM E413 - Classification for Rating Sound Insulation; 2022.

D. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2023.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

G. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2025, with Amendment (2024).

H. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2025.

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

J. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

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. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
   1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

E. Samples: Submit two samples of door construction, 12 x 12 inch (300 x 300 mm) in size cut from top corner of door.

F. Samples for Selection: Provide manufacturer's color chart showing full range of available colors for wood species specified.

G. Samples for verification: Submit two samples of door veneer of species specified, 12 x 12 inch (300 x 300 mm) in size illustrating range of color variation, wood grain, stain color, and sheen.

H. Manufacturer's Installation Instructions: Indicate special installation instructions.

I. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than ten (10) years of experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of experience.

C. Woodwork Quality Assurance Program:
   1. Provide labels indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by quality assurance program.
   3. Provide designated labels on installed products as required by quality assurance program.
   4. Submit documentation upon completion of installation that verifies this work is in compliance with specified requirements.

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.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. VT Industries, Inc.; "Heritage" flush wood veneer: www.vtindustries.com.
   2. Alliance Door Products; "Lynden" Wood Veneer Flush Doors: www.aliancedoorproducts.com.
   3. Graham/Maiman an Assa Abloy Corporation Company: Custom Flush Wood Doors; www.assaabloywooddoors.com
   4. Lynden Door, Inc; Wood Veneer Doors: www.lyndendoor.com/#sle.
   5. Oregon Door; Flush Wood Doors: www.oregondoor.com/#sle.
   6. Substitutions: See Section 016000 - Product Requirements.

B. Sound-Rated Wood Doors:
   1. Lynden Door, Inc; Sound-Rated Doors: www.lyndendoor.com/#sle.
   2. Oregon Door: www.oregondoor.com/#sle.
   3. VT Industries, Inc; Heritage: www.vtindustries.com/#sle.

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), AWMAC/WI (NAAWS) or WDMA I.S. 1A.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Fire Rated Doors: Tested to 90 minutes in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
   3. Wood veneer facing with factory transparent finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: staved lumber core (SLC).

B. Construction: five or seven plies. stiles and rails bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.

C. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

D. Sound-Rated Doors: Equivalent to type, with cores as required to achieve STC rating specified; plies and faces as indicated above. STC Rating - 46-52.

2.04 DOOR FACINGS

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

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:
   1. Provide solid blocks at lock edge for hardware reinforcement.
   2. Provide solid blocking for other throughbolted hardware.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
   1. Exception: Doors to be field finished.

F. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. System - 1, Lacquer, Nitrocellulose.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

B. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
   1. Transparent:
      a. System - TR-2, Catalyzed Lacquer.
      b. Stain: As selected by Architect.
      c. Sheen: Satin.

C. Factory finish doors in accordance with approved sample.

D. Seal door top and bottom edges with color sealer to match door facing.

2.07 ACCESSORIES

A. Hollow Metal Door Frames: See Section 081113.

B. Glazing: See Section 088000.

C. Astragals and Edges for Double Doors: Pairs of doors astragals, and door edge sealing and protection devices.
   1. UL listed products in compliance with requirements of authorities having jurisdiction.
   2. Edge Type: Beveled edge
   3. Material: Stainless steel.

D. Astragals for Fire-Rated Double Doors: Steel, T shaped, overlapping and recessed at face edge, specifically for double doors.

E. Door Hardware: See Section 087100.

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.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.
   2. Install smoke and draft control doors in accordance with NFPA 105 requirements.
   3. Install exterior doors in accordance with ASTM E2112.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Install door louvers plumb and level.

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.

3.05 SCHEDULE

A. See Door and Frame Schedule appended to Drawings.

END OF SECTION 081416

SECTION 083100
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall- and ceiling-mounted access units.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Mortise cylinder and core hardware.

B. Section 099123 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

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

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

1.04 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.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Record actual locations of each access unit.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:
   1. Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
   2. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   3. Key-operated spring or cam lock; no handle.
   4. Exterior Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

B. Wall-Mounted Units in Wet Areas:
   1. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
   2. Size: 12 by 12 inches (305 by 305 mm).
   3. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
   4. Key-operated spring or cam lock; no handle.
   5. Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

C. Fire-Rated Wall-Mounted Units:
   1. Wall Fire-Rating: As indicated on drawings.

D. Gypsum Board Ceilings, Unless Otherwise Indicated: Same type as for walls.

2.02 WALL- AND CEILING-MOUNTED ACCESS UNITS

A. Manufacturers:
   1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
   2. ACUDOR Products Inc: www.acudor.com/#sle.
   3. Babcock-Davis: www.babcockdavis.com.
   4. Best Access Doors: www.bestaccessdoors.com/#sle.
   5. Cendrex, Inc: www.cendrex.com/#sle.
   6. Elmdor: www.elmdor.com/#sle.

7. Nystrom, Inc; <>: www.nystrom.com/#sle.
8. Substitutions: See Section 016000 - Product Requirements.

B. Wall- and Ceiling-Mounted Units: Factory-fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
1. Style: Exposed frame with door surface flush with frame surface.
a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
2. Door Style: Single thickness with rolled or turned in edges.
3. Frames: 16-gauge, 0.0598-inch (1.52 mm) minimum thickness.
4. Insulation: Non-combustible mineral wool or glass fiber.
5. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.
6. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
7. Hardware:
a. Hardware for Fire-Rated Units: As required for listing.
b. Hinges for Non-Fire-Rated Units: Continuous piano hinge.
c. Latch/Lock: Screw driver slot for quarter turn cam latch. Interior

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 083100

SECTION 083313
COILING COUNTER DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated coiling counter doors and operating hardware.

B. Wood coiling counter doors and operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 087100 - Door Hardware.

C. Section 092116 - Gypsum Board Assemblies: Rough openings.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

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

B. Product Data: Submit manufacturer's standard literature showing materials and details of construction and finish. Include data on electrical operation.

C. Shop Drawings: Indicate rough and actual opening dimensions, anchorage methods, hardware locations, and installation details.

D. Samples: Two slats, 4 inches long, illustrating shape, color, and finish texture.

E. Manufacturer's Installation Instructions: Indicate installation sequence and installation, adjustment, and alignment procedures.

F. Operation and Maintenance Data: Indicate modes of operation, lubrication requirements and frequency, and periodic adjustments required.

1.05 WARRANTY

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Coiling Counter Wood Doors:
   1. Alpine Overhead Doors, Inc; Wooden Counter Shutters: www.alpinedoors.com/#sle.
   2. Overhead Door Corporation; Series 665 - Wood Counter Door: www.overheaddoor.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 COILING COUNTER DOORS

A. Coiling Counter Wood Doors: Natural birch wood slat curtain.
   1. Mounting: As indicated on drawings, within prepared opening.
   2. Nominal Slat Size: 1-1/2 inch wide by 1/2 inch thick.
   3. Slat Profile: Flat, with long edges rabbeted to interlock forming sight-proof curtain.
   4. Bottom Rail: Flat, with solid wood profile matching grain and species of slat.
   5. Bottom Rail Size: 5 inch wide by 1-5/8 inch thick
   6. Wood Finish: Factory finished after fabrication.
   7. Sand sight-exposed wood surfaces to smooth finish.
   8. Interlocking Hardware: Manufacturers standard, concealed within slat and bottom rail profile.
   9. Guides: Manufacturers standard for indicated counter door mounting and operation; same material and finish unless otherwise indicated.

10. Hood Enclosure: Manufacturer's standard, with fascia; concealed fastener construction to allow hood removal for servicing counter door.
11. Fascia: Manufacturer's standard; concealed fastener construction to allow hood removal for servicing counter door.
12. Manual hand crank operation with geared lifting and lowering mechanism.
13. Guide Spacers: Manufacturers standard, to provide necessary gear box clearance.
14. Locking Devices: Manufacturer standard sidebolt, surface mounted to curtain bottom rail at each side of curtain.
    a. Furnish two keys per lock, with cylinders specified in Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that adjacent construction is suitable for door installation.

B. Verify that door opening is plumb, header is level, and dimensions are correct.

C. Notify Architect of any unacceptable conditions or varying dimensions.

D. 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.

3.03 TOLERANCES

A. Maintain dimensional tolerances and alignment with adjacent work.

B. Maximum Variation From Plumb: 1/16 inch.

C. Maximum Variation From Level: 1/16 inch.

D. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 ft 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 083313

SECTION 083613
SECTIONAL DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead and sliding sectional doors, electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Rough wood framing for door opening.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 099113 - Exterior Painting: Finish painting.

D. Section 099123 - Interior Painting: Finish painting.

E. Section 260583 - Wiring Connections.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

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 C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

D. DASMA 102 - American National Standard Specifications for Sectional Doors; 2018.

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

F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

G. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

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

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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

K. 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: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Product Data: Show component construction, anchorage method, and hardware.

D. Samples: Two panel finish samples, ___ by ___ inch in size, illustrating color and finish.

E. Operation Data: Include normal operation, troubleshooting, and adjusting.

F. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of experience.

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

C. Comply with applicable code for motor and motor control requirements.

1.06 WARRANTY

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

B. Manufacturer Warranty: Provide 2-year manufacturer warranty for parts and components. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sectional Doors:
   1. Overhead Door Corporation; Model 511 - Aluminum Glass Door: www.overheaddoor.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

2.03 ALUMINUM DOORS

A. Doors: Flush aluminum, insulated; low headroom operating style with track and hardware, in accordance with DASMA 102, commercial application.
   1. Door Nominal Thickness: 1-3/4 inches.
   2. Finish: Factory anodized; bronze anodized.
   3. Glazed Lites: Full panel width, all row; set in place with security glazing stops
      a. Glazing: Fully tempered glass; insulated glass units; clear; 1/2 inch overall thickness.
   4. Electric Operation: Electric control station.

2.04 COMPONENTS

A. Track: Galvanized steel angles, 0.094 inch minimum thickness; 2-5/16 x 4 inch size, continuous one piece per side; galvanized steel mounting brackets 1/4 inch thick.

B. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

C. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.

D. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

E. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

F. Head Weatherstripping: EPDM rubber seal, one piece full length.

G. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

H. Lock: Inside side mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

I. Lock Cylinders: Keyed alike.

2.05 MATERIALS

A. Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G60/Z180 coating, plain surface.

B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

C. Float Glass: Provide float glass glazing, unless noted otherwise.
   1. Heat-Strengthened and Fully Tempered Types: ASTM C1048.

D. Insulation: Foamed-in-place polyurethane.

2.06 ELECTRIC OPERATION

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 on cross head shaft.
   2. Overhead RLD Jackshaft Operator
   3. Motor Enclosure:
      a. Interior Doors: NEMA MG 00001, Type 1; open drip proof.
   4. Motor Rating: 1/2 hp; continuous duty.
   5. Motor Voltage: 120 volts, single phase, 60 Hz.
   6. Motor Controller: NEMA ICS 2, full voltage, reversing magnetic motor starter.
   7. Controller Enclosure: NEMA EN 10250, Type 1.
   8. Opening Speed: 7.5 inches per second.
   9. Brake: Adjustable friction clutch type, activated by motor controller.
   10. Manual override in case of power failure.
   11. See Section 260583 for electrical connections.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated; enclose terminal lugs in terminal box sized to comply with NFPA 70.

D. 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.

E. Safety Edge: Located at bottom of sectional door panel, full width; electro-mechanical sensitized type, wired to stop and reverse door direction upon striking object; hollow neoprene covered to provide weatherstrip seal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

B. Apply primer to wood frame.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 CLEANING

A. Clean doors and frames and glazing.

B. Remove temporary labels and visible markings.

3.07 PROTECTION

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

B. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION 083613

SECTION 084313
ALUMINUM-FRAMED STOREFRONT WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors.

C. Aluminum-framed, thermally broken windows.

D. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers: Sealing framing to water-resistive barrier installed on adjacent construction.

B. Section 079200 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 084229 - Automatic Entrances: Powered operators.

D. Section 087100 - Door Hardware: Hardware items other than specified in this section.

E. Section 088000 - Glazing: Glass and glazing accessories.

F. Section 122400 - Window Shades: Attachments to framing members.

1.03 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2025.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum; 2025.

C. AAMA 611 - Specification for Anodized Architectural Aluminum; 2026.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2026.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

H. 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; 2026.

I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014 (Reapproved 2021).

J. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015 (Reapproved 2023).

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

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

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

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples for Selection: Provide manufacturer's color selection sheet with full range of available colors.

E. Samples for Verification: Submit two corner samples 6 x 2 inches (150 x 50 mm) in size illustrating finished aluminum surface, glass, seals, and glazing materials.

F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

G. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

H. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.

I. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least ten (10) years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least five (5) years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

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

1.09 WARRANTY

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

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

D. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Thermally-Broken:
   1. Basis of Design: Kawneer, 451T.
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep (51 mm wide by 114 mm deep).

B. Center-Set Wide Style, Thermally-Broken Entrance System:
   1. Basis of Design: Kawneer 500 Series Entrance doors, extra heavy-duty frames and hinges.

2. Vertical Mullion Dimensions: 5 inches wide by 1 3/4" deep (127 x 45).
3. Door Stiles: Wide vertical stiles wrapped with metal cladding that is applied using very high bond (VHB) tape mounting strips.
4. Door Rails: Mechanically clamping seals that eliminate the need for glass stops and controls the clamping force of EPDM glazing gasket against insulating glass units; setting blocks are factory installed.
5. Cladding Finish: Superior performing organic coating.
6. Top Rail Height: 5 inch (___ mm).
7. Bottom Rail Height: 12 inch (___ mm).

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:

D. Substitutions: See Section 016000 - Product Requirements.

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Insulating Glazing, Thermally-Broken:
1. Basis of Design: Kawneer 500 Entrances.

B. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:

C. Substitutions: See Section 016000 - Product Requirements.

2.03 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
1. Glazing Rabbet: For 1 inch (25 mm) insulating glazing.
2. Finish: Superior performing organic coatings.
   a. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
3. Finish Color: #40 Dark Bronze. Verify existing building frames
4. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
5. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
7. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
8. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
9. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
10. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
11. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

B. Performance Requirements
1. Delegated design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality requirements," to design aluminum-framed entrances and storefronts.
2. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts represeenting those indicated for

this Project without failure due to defective manufacture, fabrication, installation or other defects in construction.

a. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distibuted and concentrated live loads.
b. Failure also includes the following:
    1) Thermal stresses transferring to building structure.
    2) Glass breakage.
    3) Noise or vibration created by wind and thermal or structural movements.
    4) Loosening or weakening of fasteners, attachments and other comonents.
    5) Failure of operating units.
c. Structural: Test according to ASTM E 330 as follows:
    1) When tested at positive

3. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
    a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
4. Air Leakage: 0.06 cfm/sq ft (0.3 L/sec sq m) maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf (75 Pa) pressure difference.

2.04 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
    1. Framing members for interior applications need not be thermally broken.
    2. Glazing Stops: Flush.

B. Glazing: See Section 088000.

C. Swing Doors: Glazed aluminum.
    1. Thickness: 1-3/4 inches (43 mm).
    2. Top Rail: 5 inches (____ mm) wide.
    3. Vertical Stiles: 5 inches (____ mm) wide.
    4. Bottom Rail: 12 inches (____ mm) wide.
    5. Glazing Stops: Square.
    6. Finish: Same as storefront.

2.05 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

D. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

E. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.06 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils (0.018 mm) thick.

2.07 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and Thermally Broke Threshold.

B. Other Door Hardware: Storefront manufacturer's standard type to suit application.
    1. Finish on Hand-Contacted Items: Polished stainless steel.

2. For each exterior door, include exit device, closer, and Continuous Hinge. Removable mullion.
    a. Continuous Hinge: #40 Dark Bronze
    b. Kawneer 1786 Rim Exit Device, exterior lever trim handle. #40 Dark Bronze
    c. RM86 Removable Mullion: #40 Dark Bronze

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install hardware using templates provided.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet (1.5 mm per m) non-cumulative or 0.06 inch per 10 feet (1.5 mm per 3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 FIELD QUALITY CONTROL

A. Water-Spray Test: Provide water spray quality test of installed storefront components in accordance with AAMA 501.2 during construction process and before installation of interior finishes.
    1. Perform a minimum of two tests in each designated area as indicated on drawings.
    2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.

3.05 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.06 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.07 PROTECTION

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

END OF SECTION 084313

SECTION 087100
DOOR HARDWARE

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. BHMA A156.4 - Door Closers and Pivots; 2024.

B. BHMA A156.18 - Standard for Materials and Finishes; 2020.

C. BHMA A156.25 - Electrified Locking Devices; 2023.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. This Section includes the following:
   1. Commercial door hardware for the following:
      a. Doors to the extent indicated.

B. Related Sections include the following:
   1. Section 08 1113 - "Hollow Metal Doors and Frames"
   2. Section 08 1416 - “Flush Wood Doors”
   3. Section 08 4313 - “Aluminum-Framed Storefront Windows and Doors”
   4. Section 10 2213 - "Wire Mesh Partitions": cylinders for locks in mesh partition doors.

1.04 SUBMITTALS

A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:
   1. Wiring Diagrams: Power, signal, and control wiring. Include the following:
      a. System schematic.
      b. Point-to-point wiring diagram.
      c. Riser diagram.
      d. Elevation of each door.
   2. Detail interface between electrified door hardware and access control system.
   3. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

C. Samples for Initial Selection: For each finish, color, and texture required for each type of door hardware indicated.

D. Samples for Verification (if requested): For exposed door hardware of each type, in specified finish, full size. Tag with full description for coordination with the door hardware sets. Submit Samples before, or concurrent with, submission of the final door hardware sets.
   1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

E. Product Certificates: For electrified door hardware, signed by product manufacturer.

F. Qualification Data: For Installer and Architectural Hardware Consultant.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for locks.

H. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware schedule.

I. Warranty: Special warranty specified in this Section.

J. Other Action Submittals:

1. Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
    a. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.
    b. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
    c. Content: Include the following information:
    d. Identification number, location, hand, fire rating, and material of each door and frame.
    e. Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
    f. Complete designations of every item required for each door or opening including name and manufacturer.
    g. Fastenings and other pertinent information.
    h. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    i. Explanation of abbreviations, symbols, and codes contained in schedule.
    j. Mounting locations for door hardware.
    k. Door and frame sizes and materials.
    l. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
    m. Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
    n. List of related door devices specified in other Sections for each door and frame.
        1) Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
        2) Submittal Sequence: Submit initial draft of final schedule along with essential Product Data to facilitate the fabrication of other work that is critical in Project construction schedule. Submit the final door hardware sets after Samples, Product Data, coordination with Shop Drawings of other work, delivery schedules, and similar information has been completed and accepted.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and who have been installing door hardware for at least five years.

1. Installer's responsibilities include installing door hardware and being available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware.

B. Supplier Qualifications: A distributor of commercial door hardware in the project vicinity for at least five years. The supplier must have a factory direct status with the approved manufacturers.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.

D. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to electrified door hardware including, but not limited to, the following:
   1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
   2. Review sequence of operation for each type of electrified door hardware.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review required testing, inspecting, and certifying procedures.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

1.07 COORDINATION

A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies and access control system.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware which fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including excessive deflection, cracking, or breakage.
      b. Faulty operation of operators and door hardware.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
      d. Ordinary wear and tear shall not be excluded from any warranty since the hardware should hold up to normal use.
   2. Warranty Period: One year from date of Substantial Completion, except as follows:
      a. Exit Devices: 10 years from date of Substantial Completion.
      b. Manual Closers: 30 years from date of Substantial Completion.
      c. Locksets: 10 years from date of Substantial Completion.

1.09 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 PRODUCTS

2.01 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in door and frame schedule.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

2.02 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22 N).

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf (67 N) to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Electrified Locking Devices: BHMA A156.25.

D. Lock Trim:
   1. Levers: Cast.
   2. Escutcheons (Roses): Stamped.
   3. Dummy Trim: Match lever lock trim and escutcheons.
   4. Lockset Designs: Schlage Rhodes

E. Rabbeted Meeting Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.

F. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.

G. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

2.03 KEYING

A. All cylinders to be provided with a construction key system. Final key system to be Schlage Everest C per owner standards. Install final key system when building is complete and when directed by Owner.
   1. Furnish a construction key system that can be easily converted to final keying. Temporary plastic cores or keys are not allowed.
   2. Meet with Owner to determine final keying schedule. Submit for Owner approval no more than (10) days after meeting.
   3. All keys shall be stamped with “Do Not Duplicate”.
   4. Furnish the following key quantities:
      a. Construction keys: (10) keys.
      b. Final keys: (2) keys per cylinder, (3) master keys.

2.04 CLOSERS

A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board’s “Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG).”

B. Size of Units: Unless otherwise indicated, comply with manufacturer’s written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

C. Surface Closers: BHMA A156.4, Grade 1 Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.

D. Closer arms shall be extra duty where noted in the hardware schedule.

2.05 FABRICATION

A. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

B. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

2.06 FINISHES

A. Standard: BHMA A156.18, as indicated in door hardware sets.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.07 ACCEPTABLE MANUFACTURERS

A. Substitutions to the list below will be considered if submitted at least (7) days prior to bid date and on a standard CSI substitution request form. Include documentation to show that the requested approval is equal to or performs better than the specified products.

Product	Specified Manufacturer	Approved Manufacturer
Hinges	Ives (IVE)	Stanley
Flushbolts/Coordinators	Ives (IVE)	DCI
Locks/Latches	Schlage (SCH)	None- match existing
Cylinders	Schlage (SCH)	None- match existing
Panic Hardware	Von Duprin	None- match existing
Closers	LCN (LCN)	None- match existing
Auto Operators	LCN (LCN)	None- match existing
Push/Pulls	Ives (IVE)	Trimco
Wall Stops	Ives (IVE)	Trimco
Overhead Stops	Glynn Johnson (GLY)	Rixson
Kickplates	Ives (IVE)	Tice, Trimco
Astragals	Zero (ZER)	NGP, Pemko
Thresholds, Seals, Door Bottoms	Zero (ZER)	NGP, Pemko
Silencers	Ives (IVE	Trimco

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

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

3.02 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 Series.
   1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

3.03 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
   1. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (76.2 mm) from the latch, measured to the leading edge of the door.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel how to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 01 Section "Demonstration and Training."

3.07 HARDWARE GROUPS

END OF SECTION 087100

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HARDWARE GROUP NO. 01

100

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10 CON		689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-35A-NL-OP-388-CON 24 VDC		626	VON
1	EA	RIM CYLINDER	20-057 ICX		626	SCH
1	EA	FINAL CORE	23-030 EV C (CONFIRM KEYWAY WITH OWNER)		626	SCH
1	EA	90 DEG OFFSET PULL	8190EZHD 12" O		630AM -316	IVE
1	EA	OH STOP	100S		630	GLY
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC		689	LCN
1	EA	ACTUATOR, TOUCH	8310-818T			LCN
1	EA	DBL ACTUATOR-VESTIBULE	8310-855			LCN
1	SET	WEATHER STRIPPING	PROVIDED BY DOOR/FRAME MANUFACTURER (ALSO FOR INTERIOR DOORS-SOUND PURPOSES)			
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THERMAL BREAK THRESHOLD	626A-223		A	ZER
1	EA	WIRE HARNESS	CON-44P (FROM EPT TO ELECTRIC HARDWARE- VERIFY PROPER LENGTH)			SCH
1	EA	WIRE HARNESS	CON-6W (FROM EPT TO INCOMING POWER)			SCH
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC			VON
1	EA	ACCESS CONTROL	PROVIDED BY DIV 28			

AUTO OPERATOR & POIWER SUPPLY REQUIRE 120VAC. EXTERIOR ACTUATOR TO BE ENABLED BY ACCESS CONTROL SYSTEM. INTERIOR VESTIBULE ACTUATOR TO ALWAYS UNLOCK PANIC DEVICE AND AUTO OPEN DOOR WHEN PRESSED.

HARDWARE GROUP NO. 02

101

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	DUMMY PUSH BAR	350		626	VON
1	EA	90 DEG OFFSET PULL	8190EZHD 12" O		630AM-316	IVE
1	EA	SURF. AUTO OPERATOR	4642 WMS 120 VAC		689	LCN
1	EA	ACTUATOR, TOUCH	8310-818T			LCN
1	EA	FLOOR STOP	FS441		626	IVE
1	SET	WEATHER STRIPPING	PROVIDED BY DOOR/FRAME MANUFACTURER (ALSO FOR INTERIOR DOORS-SOUND PURPOSES)			

AUTO OPERATOR REQUIRES 120VAC.

HARDWARE GROUP NO. 03

114 116

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	ND70P6D RHO	626	SCH
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 04

113

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	ENTRANCE LOCK	ND53P6D RHO (CE KEYWAY)	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA (FOR SOUND)	BK	ZER

HARDWARE GROUP NO. 05

103A 104A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70P6D RHO		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (FOR SOUND)		BK	ZER

HARDWARE GROUP NO. 06

104B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	LD-98-EO		626	VON
1	EA	CLOSER W/STOP ARM	4111 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA		AA	ZER
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THERMAL BREAK THRESHOLD	626A-223		A	ZER

EXIT ONLY.

HARDWARE GROUP NO. 07

105 106 107

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80P6D RHO		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE GROUP NO. 08

108 109 110 121

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PRIVACY W/OCCUP. INDIC.	ND50P6D RHO OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA (FOR SOUND)		BK	ZER

HARDWARE GROUP NO. 09

111

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1 4.5 X 4.5 NRP		652	IVE
1	EA	CONST LATCHING BOLT	FB61T		630	IVE
1	EA	STOREROOM LOCK	ND80P6D RHO		626	SCH
2	EA	OH STOP	90S		630	GLY
1	EA	FLAT ASTRAGAL	44STST		STST	ZER
2	EA	SILENCER	SR64		GRY	IVE

HARDWARE GROUP NO. 10

115

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (FOR SOUND)		BK	ZER

HARDWARE GROUP NO. 11

117

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80P6D RHO		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

HARDWARE GROUP NO. 12

118 119 120

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50P6D RHO		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA (FOR SOUND)		BK	ZER

HARDWARE GROUP NO. 13

122A

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50P6D RHO		626	SCH
1	EA	SURFACE CLOSER	4011		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	488SBK PSA (FOR SOUND)		BK	ZER

HARDWARE GROUP NO. 14

122B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP			630	IVE
1	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	EU STOREROOM LOCK	ND80P6DEU RHO RX CON 12V/24V DC			626	SCH
1	EA	LOCK GUARD	LG13			630	IVE
1	EA	CLOSER W/STOP ARM	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	RAIN DRIP	142AA			AA	ZER
1	EA	GASKETING	188SBK PSA			BK	ZER
1	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THERMAL BREAK THRESHOLD	626A-223			A	ZER
1	EA	WIRE HARNESS	CON-44P (FROM EPT TO ELECTRIC HARDWARE- VERIFY PROPER LENGTH)				SCH
1	EA	WIRE HARNESS	CON-6W (FROM EPT TO INCOMING POWER)				SCH
1	EA	ACCESS CONTROL	PROVIDED BY DIV 28				

HARDWARE GROUP NO. 15

112

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5			652	IVE
1	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	EU STOREROOM LOCK	ND80P6DEU RHO RX CON 12V/24V DC			626	SCH
1	EA	SURFACE CLOSER	4011			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	WALL STOP	WS406/407CVX			630	IVE
3	EA	SILENCER	SR64			GRY	IVE
1	EA	WIRE HARNESS	CON-44P (FROM EPT TO ELECTRIC HARDWARE- VERIFY PROPER LENGTH)				SCH
1	EA	WIRE HARNESS	CON-6W (FROM EPT TO INCOMING POWER)				SCH
1	EA	ACCESS CONTROL	PROVIDED BY DIV 28				

HARDWARE GROUP NO. 16

103B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP			630	IVE
1	EA	POWER TRANSFER	EPT10 CON			689	VON
1	EA	ELEC PANIC HARDWARE	LD-RX-98-L-M996-06-FSE-CON			626	VON
1	EA	RIM CYLINDER	20-057 ICX			626	SCH
1	EA	FINAL CORE	23-030 EV C (CONFIRM KEYWAY WITH OWNER)			626	SCH
1	EA	CLOSER W/STOP ARM	4111 SCUSH			689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS			630	IVE
1	EA	RAIN DRIP	142AA			AA	ZER
1	EA	GASKETING	188SBK PSA			BK	ZER
1	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THERMAL BREAK THRESHOLD	626A-223			A	ZER
1	EA	WIRE HARNESS	CON-44P (FROM EPT TO ELECTRIC HARDWARE- VERIFY PROPER LENGTH)				SCH
1	EA	WIRE HARNESS	CON-6W (FROM EPT TO INCOMING POWER)				SCH
1	EA	ACCESS CONTROL	PROVIDED BY DIV 28				

SECTION 088000
GLAZING

SPECIFYING STRATEGY

1.01 HOW TO USE THIS SECTION

A. The most important step is the selection of companion narrow scope sections which contain the bulk of Part 2 content relevant to specific glazing product type.

B. Part 3 of this section is intended to function as a single location for "glazing methods" applicable to any number of glazing products. Therefore, installation accessories have been retained in this section. The other sections in this group have their installation methods linked to this section.

C. Edit the "Installation - Glazing Methods" list in Part 3 to correspond with types of openings and applications in the project. Glazing methods differ based on application, framing, and location (exterior or interior). Type of glazing material is a less critical criterion for selection of optimal glazing method.

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Insulating glass units.nf

B. Glazing units.

C. Fire-rated glazing units

D. Plastic films.

E. Direct to Glass Printing

F. Glazing compounds.

2.02 RELATED REQUIREMENTS

A. Section 072500 - Weather Barriers.

B. Section 079200 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 088300 - Mirrors.

2.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2026.

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

D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).

E. ASTM C1036 - Standard Specification for Flat Glass; 2025.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).

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

H. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

I. GANA (SM) - GANA Sealant Manual; 2008.

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

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

2.04 ADMINISTRATIVE REQUIREMENTS

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

2.05 SUBMITTALS

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

B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch (___ by ___ mm) in size of glass units.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

2.06 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

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

C. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of documented experience.

2.07 MOCK-UPS

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

B. Provide mock-up of buiding corner with assembled window, including glass and air barrier and vapor retarder seal.

C. **Provide mock-up of printed glass design on specified glass for approval and/or revisions.**

D. Locate as indicated on drawings.

E. Mock-ups may remain as part of the Work.

2.08 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.

2.09 WARRANTY

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

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

1. Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

2. Manufacturer agrees to replace coated-glass that deteriorates within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.
   1. Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

PART 2 PRODUCTS

3.01 MANUFACTURERS

A. Float Glass Manufacturers:
   1. Guardian Glass, LLC; <>: www.guardianglass.com/#sle.
   2. PPG Industries, Inc: www.ppgideascapes.com.

B. Laminated Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com.
   2. Viracon, Architectural Glass segment of Apogee Enterprises, Inc: www.viracon.com.
   3. Substitutions: See Section 016000 - Product Requirements.

C. Digital Ceramic Printing Manufacturers:
   1. GGI - General Glass International; ALICE - Direct to glass printing: www.generalglass.com/#sle.
      a. Custom Tribal designs on gymnasium windows.
         1) Vector- Type images required. Steele Associates Architects can provide for fee. (Approx. $4,500)
   2. Substitutions: Refer to Section 016000 - Product Requirements.

D. Plastic Films Manufacturers:
   1. 3M Window Film; 3M 7725SE Scotchcal Dusted Crystal Graphic Film: www.3m.com.
      a. Grimco: Portland, Oregon - 800-542-9941.
   2. The Amgraph Group; HD frost: www.hdclearfilm.com
      a. Ontario, California - 877-321-8421.
   3. Decorative Films; SOLYX iQ clear super clear SR Polyster:www.decorativefilm.com
      a. Frederick, Maryland - 888-657-5224.
   4. Substitutions: See Section 016000 - Product Requirements.

3.02 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. All exterior glazing at building entry doors and window glazing at administrative office areas shall have shatter resistant film meeting performance condition ‘3b’ or laminated security glass required to meet Level II security requirements.

B. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with ASCE 7.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

C. 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:

D. 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-Factor: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 7 computer progam.
   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.

3.03 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. Patterned Glass Type: ASTM C1036, Type II - Patterned Flat Glass, Quality - Q5, Form 3 - Patterned glass, with color and performance characteristics as indicated.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise specified.
   2. Optical Distortion Limits: Maximum peak-to-valley roll wave 0.005” (0.127mm) in the central area of the glass lite, excluding the leading and trailing 12”; per ASTM C 1651.
   3. Maximum center-kink of 0.001” (0.025 mm) when roll wave is measured over the surface of the glass perpendicular to the direction of travel through the tempering furnace.
   4. Maximum localized bow (warp) per lite shall be 1/32” (0.79 mm) per lineal foot, one-half of the ASTM C 1048 allowance. Maximum overall bow (warp) per lite shall also be one-half of the ASTM C 1048 allowance.
   5. Fully tempered glass shall only be used where required by code for safety, thermal stress, load or other specification requirements. Heat-strengthened glass should be used unless tempered glass is specifically required. All tempered glass shall conform with ANSI Z97.1 and CPSC 16 CFR 1201.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise specified.
   2. Optical Distortion Limits: Maximum peak-to-valley roll wave 0.005” (0.127mm) in the central area of the glass lite, excluding the leading and trailing 12”; per ASTM C 1651.
   3. Maximum center-kink of 0.001” (0.025 mm) when roll wave is measured over the surface of the glass perpendicular to the direction of travel through the tempering furnace.
   4. Maximum localized bow (warp) per lite shall be 1/32” (0.79 mm) per lineal foot, one-half of the ASTM C 1048 allowance. Maximum overall bow (warp) per lite shall also be one-half of the ASTM C 1048 allowance.
   5. Heat-strengthened glass shall be used at east, south and west facing exterior windows and doors unless tempered glass is specifically required.

D. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.
   2. Polyvinyl Butyral (PVB) Interlayer: 0.030 inch (0.762 mm) thick, minimum.

E. Fire Rated Safety Glazing: Composed of multiple sheets of safety glazing with high visible light transmission laminated with a fire resistant intumescent interlayer.

3.04 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 argon.
   3. Total Thickness: 1 inch (25.4 mm).
   4. Visible Light Transmittance (VLT): 70 percent, nominal.
   5. Solar Heat Gain Coefficient (SHGC): .39, nominal.
   6. Glazing Method: Dry glazing method, gasket glazing.
   7. Metal Edge Spacers: Aluminum, mitered and spigoted corners.
   8. Spacer Color: Match window frames.
   9. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   10. Color: Black.
   11. Purge interpane space with dry air, hermetically sealed.
   12. Basis of Design - Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
   13. Outboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick, minimum.
      a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 60 on #2 surface.
      b. Glass: Clear.
   14. Inboard Lite: Annealed float glass, 1/4 inch (6.4 mm) thick.
      a. Coating: No coating on inboard lite.
      b. Glass: Clear.
      c. Inboard Lite at Gymnasium- Laminated.

3.05 GLAZING UNITS

A. Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6.4 mm), nominal.

B. Monolithic Safety Glazing: Non-fire-rated.

C. Direct to Glass Ceramic Printing: Ceramic frit is fused into glass creating permanent designs.
   1. Applications: Locations as indicated on drawings.
   2. Color: As selected by Architect from manufacturers standard line.
   3. Printing Style: As selected by Architect from manufacturers standard line.
   4. Glass Type: Fully tempered; monolithic glass system.
   5. Thickness: 1/4 inch (6.4 mm), nominal.
   6. Size: As indicated on drawings
   7. Manufacturers:
      a. GGI - General Glass International; Alice Direct-to-Glass Printing: www.generalglass.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

3.06 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. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.

C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

D. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

3.07 SOURCE QUALITY CONTROL

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

B. Provide shop inspection and testing for Type IG-3 and G-2 glass.

PART 3 EXECUTION

4.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

4.02 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.

4.03 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, but not limited to, the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

4.04 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.

4.05 INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

F. Carefully trim protruding tape with knife.

4.06 INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

4.07 INSTALLATION - WET GLAZING METHOD (SEALANT AND SEALANT)

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Place setting blocks at 1/4 points and install glazing pane or unit.

C. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch (610 mm) intervals, 1/4 inch (6.4 mm) below sight line.

D. Fill gaps between glazing and stops with manufacturer's recommended type of sealant to depth of bite on glazing, but not more than 3/8 inch (9 mm) below sight line to ensure full contact with glazing and continue the air and vapor seal.

E. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

4.08 INSTALLATION - PLASTIC FILM

A. Install plastic film with adhesive, applied in accordance with film manufacturer's instructions.

B. Place without air bubbles, creases or visible distortion.

C. Install film tight to perimeter of glass and carefully trim film with razor sharp knife. Provide 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) gap at perimeter of glazed panel unless otherwise required. Do not score the glass.

4.09 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.

4.10 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.

4.11 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 088000

SECTION 088813
FIRE-RATED GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.02 RELATED REQUIREMENTS

A. Section 081113 - Hollow Metal Doors and Frames: Glazed lites in doors, borrowed lites, and transoms.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2026.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2026).

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

E. ASTM C1036 - Standard Specification for Flat Glass; 2025.

F. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).

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

H. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.

I. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2024.

J. GANA (GM) - GANA Glazing Manual; 2022.

K. GANA (SM) - GANA Sealant Manual; 2008.

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

M. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

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

O. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

P. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2022.

Q. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2023.

R. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2023.

S. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2026.

T. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.

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

V. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

W. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

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

Y. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

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

1.05 SUBMITTALS

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

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Two samples ___ by ___ inch in size of glass units.

E. Samples: Two samples of ____ inch long bead of glazing sealant, color as selected.

F. Certificate: Certify that products of this section meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM), GANA (SM), IGMA TM-3000, and NGA (LGRM) for glazing installation methods. Maintain one copy on site.

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

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

1.07 FIELD CONDITIONS

A. Ambient Conditions: Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during, and 24 hours after installation of glazing compounds.

1.08 WARRANTY

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

B. Manufacturer Warranty for Insulating Glass Units: Provide 5-year manufacturer warranty coverage for seal failure, interpane dusting or misting, including providing products to replace failed units, and commencing on the Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire-Resistance-Rated Glass:
   1. Fabricators:
      a. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.

B. Fire-Protection-Rated Glass:
   1. Fabricators:
      a. Technical Glass Products: www.fireglass.com/#sle.
   2. Manufacturers:
      a. Nippon Electric Glass Company, LTD..

2.02 PERFORMANCE REQUIREMENTS

A. Provide type and thickness of fire-rated glazing assemblies to support required fire-resistance rating.

1. Assembly Fire Rating: 120 minutes.

B. Provide type and thickness of exterior glazing assemblies to support assembly dead loads and withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Design Pressure: Calculated in accordance with applicable codes.
   2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   3. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   4. Glass thicknesses listed are minimum.

C. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain building enclosure vapor retarder and air barrier continuity.

D. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated, in accordance with manufacturer's published data as determined with the following procedures or test methods:
   1. Center of Glass U-Factor: Determinted in accordance NFRC 100 using approved thermal analysis software.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW software.
   3. Solar Optical Properties: Comply with NFRC 300 test method.

2.03 GLASS MATERIALS

A. Float Glass: Provide float-glass-based glazing.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.

B. Glass-Ceramic Glazing: Provide glass-ceramic-based glazing.

C. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
   1. Laminated Safety Glass: Comply with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.04 GLAZING UNITS

A. Type FRG-1 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flames, smoke, and blocks radiant heat, as required to achieve indicated fire rating period exceeding 45 minutes.
   1. Applications:
      a. Glazing in fire-rated door assembly.
      b. Glazing in fire-rated window assembly.
   2. Glass Type: Multi-laminate annealed glass with intumescent fire retardant interlayers.
   3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
   4. Safety Glazing Certification: 16 CFR 1201 Category II.
   5. Fire Rating Period: 120 minutes. and 90 Minutes
   6. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
      a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
      b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
      c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
      d. 'T' - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
      e. "XXX" - placeholder that represents fire rating period, in minutes.

7. Products:
    a. Technical Glass Products; Pilkington Pyrostop 120: and Pilkington Pyrostop 90. www.fireglass.com/#sle.

2.05 GLAZING COMPOUNDS

A. Type GC-1 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; nonbleeding, nonstaining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
    1. Manufacturers:
        a. BASF Corporation: www.basf.com/#sle.
        b. Bostik Inc: www.bostik-us.com/#sle.
        c. Pecora Corporation: www.pecora.com/#sle.
        d. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
        e. Substitutions: See Section 016000 - Product Requirements.

2.06 ACCESSORIES

A. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.

B. 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, designed for compression of 25 percent to affect air barrier and vapor retarder seal;

C. Glazing Gaskets: Flexible intumescent seals.

2.07 SOURCE QUALITY CONTROL

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

B. Provide shop inspection and testing for <> glass.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Verify that sealing between joints of glass framing members has been completed effectively.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing 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 contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.04 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with '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 088813

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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 sheathing.

F. Gypsum wallboard.

G. Joint treatment and accessories.

H. Textured finish system.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 072100 - Thermal Insulation: Acoustic insulation.

D. Section 07 8400 - Firestopping: Penetrations through walls and at walls-to-other building elements.

E. Section 079200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

F. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2024.

G. AISI S201 - North American Standard for Cold-Formed Steel Framing - Product Data; 2017.

H. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

I. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2020.

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. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2025.

C. ASTM C514 - Standard Specification for Nails for the Application of Gypsum Board; 2004 (Reapproved 2020).

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2024.

E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2025.

G. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

H. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2024.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.

J. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2024.

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

L. GA-216 - Application and Finishing of Gypsum Panel Products; 2024.

M. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.

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

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

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.
   1. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

C. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches (300 by 300 mm) in size, indicating finish color and texture.

D. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches (300 by 300 mm) in size, indicating finish color and texture.

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

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Grid Suspension Systems: Provide grid suspension systems in accordance with ASTM C840 and GA-216 complying with the following:

C. Fire Rated Assemblies: Provide completed assemblies as indicated on drawings
   1. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
   2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

D. Material and Product Requirements: AISI S201 and AISI S220.

E. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S220 or equivalent.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. CEMCO: www.cemcosteel.com/#sle.
   2. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   3. SCAFCO Corporation: www.scafco.com/#sle.
   4. Phillips Manufacturing Company: www.phillipsmfg.com.
   5. Substitutions: See Section 016000 - Product Requirements.

B. 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. Paired Studs for Sound-Rated Assemblies: Engineered single-piece assemblies comprised of paired studs coupled by sound isolators, designed to replace conventional side-by-side, parallel, double-wall partition framing.
    a. Widths: As indicated on drawings.
3. Runners: U shaped, sized to match studs.
4. Flexible Track: Flexible framing consisting of adjustable leg straps and pivoting, hinged track brackets designed to provide curved framing assemblies of varying radii.
5. Ceiling Channels: C-shaped.
6. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch (22 mm).
7. Resilient Furring Channels: Single or double leg configuration; 1/2 inch (13 mm) channel depth.
    a. Products:
        1) Same manufacturer as other framing materials.

C. Area Separation Wall Studs and Accessories: Galvanized sheet steel.

D. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

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-dip galvanized coating.
3. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
    a. Products:
        1) FireTrak Corporation; Posi Klip.
        2) Metal-Lite, Inc; The System.
        3) Substitutions: See Section 016000 - Product Requirements.

F. Preformed Top Track Firestop Seal:
1. Provide components UL-listed for use in UL-listed fire-resistance-rated head of partition joint systems indicated on drawings.
2. Products:
    a. Hilti, Inc[CHOICE TEXT]: www.hilti.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.

G. Nonstructural Framing Accessories:
1. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
2. Partial Height Wall Framing Support: Provides stud reinforcement and anchored connection to floor.
3. Drywall Corner Clips: Drywall clips help support drywall to reduce wood blocking on top plates, end walls, and corners.

H. Grid Suspension Systems: Steel grid system of main tees and support bars connected to structure using hanging wire.
    a. USG Corporation; Drywall Suspension System: www.usg.com/#sle.
    b. Substitutions: See Section 016000 - Product Requirements.
2. Products:

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. CertainTeed Corporation: www.certainteed.com.
2. Georgia-Pacific Gypsum: www.gpgypsum.com.
3. National Gypsum Company: www.nationalgypsum.com.
4. USG Corporation: www.usg.com.

5. Substitutions: See Section 016000 - Product Requirements.

B. Abuse Resistant Wallboard:
   1. Application: Hallways, Studio and Fitness Room.
   2. Surface Abrasion: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   3. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   4. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
   5. Type: Fire-resistance-rated Type X, UL or WH listed.
   6. Thickness: 5/8 inch (16 mm).
   7. Edges: Tapered.
   8. Paper-Faced Products:
      a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond XP Hi-Abuse Gypsum Board: www.goldbondbuilding.com/#sle.
      b. USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 1/2 in. (12.7 mm): www.usg.com/#sle.
      c. Substitutions: See Section 016000 - Product Requirements.
   9. Glass Mat Faced Products:
      a. Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Interior Extreme AR Gypsum Panel: www.goldbondbuilding.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Backing Board For Wet Areas:
   1. Application: Surfaces behind tile in wet areas including shower walls.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178/C1178M.
      a. Fire-Resistance-Rated Type: Type X core, thickness 5/8 inch (16 mm).
      b. Products:
         1) Georgia-Pacific Gypsum; DensShield Tile Backer: www.buildgp.com/#sle.
         2) Gold Bond Building Products, LLC provided by National Gypsum Company; Gold Bond eXP Fire-Shield Tile Backer: www.goldbondbuilding.com/#sle.
         3) 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. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Type X Thickness: 5/8 inch (16 mm).
   4. Edges: Tapered.
   5. Products:
      a. Georgia-Pacific Gypsum; DensArmor Plus: www.buildgp.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

2.04 GYPSUM BOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch (_____ mm).

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
   1. Products:
      a. Franklin International, Inc; Titebond Acoustical Smoke & Sound Sealant: www.titebond.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

C. Finishing Accessories:
   1. Materials: 6063-T5 extruded aluminum alloy and G40 (Z120) galvanized steel sheet in accordance with ASTM A653/A653M.
   2. Types: As detailed or required for finished appearance.

D. Abuse Resistant Finishes:
   1. Acrylic, water-based, non-textured, high build, tintable primer and surfacer.
   2. Products:
      a. Parex USA Inc; Variance ArmourFill: www.variancefinishes.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

E. Nails for Attachment to Wood Members: ASTM C514.

F. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
   1. Level ceiling system to a tolerance of 1/600.
   2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center (at 406 mm on center), except where otherwise indicated.
   1. 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. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

F. Blocking: Install wood blocking, metal blocking or mechanically fastened steel sheet blocking for support of:
   1. Framed openings.
   2. Wall-mounted cabinets.
   3. Plumbing fixtures.
   4. Toilet partitions.
   5. Toilet accessories.
   6. Window coverings.
   7. Wall-mounted door hardware.
   8. As indicated in Section 06 1000, or required by conditions.
   9. Verify blocking requirements and locations with Owner's Representative and Architect prior to installing gypsum board cover.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.

3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board parallel to framing, with ends and edges occurring over firm bearing.

C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

E. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated on drawings.
   1. Not more than 30 feet (10 meters) apart on walls over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 TOLERANCES

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

END OF SECTION 092116

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Supplementary insulation above ceiling.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 072100 - Thermal Insulation: Acoustical insulation.

C. Section 28 3200 - Voice Evacuation Fire Alarm System: Fire alarm components in ceiling system.

1.03 REFERENCE STANDARDS

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

B. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019 (Reapproved 2025).

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

E. 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.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.05 SUBMITTALS

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

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples for Verification: Submit two samples 6 x 6 inch (____by____ mm) in size illustrating material and finish of acoustical units.

E. Samples for Verification: Submit two samples each, 6 inches (____ mm) long, of suspension system main runner.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Acoustical Units: Quantity equal to 3 percent of total installed.

1.06 QUALITY ASSURANCE

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

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

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels Type ACT-1:
   1. Basis of Design: Armstrong World Industries, Inc; Optima #3252: www.armstrong.com.
   2. MATCH EXISTING BUILDING ACT CEILING

B. Acoustic Tiles/Panels Type ACT-2:
   1. Basis of Design: Armstrong World Industries, Inc; Kitchen Zone #672: www.armstrong.com.
   2. MATCH EXISTING BUILDING ACT CEILING.
   3. This product can be used in Traning Kitchen if Owner would perfer this one.

C. Suspension Systems:
   1. Armstrong World Industries, Inc; Prelude 15/16" white: www.armstrong.com.
   2. MATCH EXISTING BUILDING CEILING GRIDS.

2.02 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Class A in accordance with ASTM E84.

B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:

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, seismic requirements, 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.

D. Acoustical Insulation: Specified in Section 072100.

E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, 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. Seismically secure system as indicated.

D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

E. Lay acoustical insulation for a distance of 48 inches either side of partitions.

F. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

G. 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.

H. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch (19 mm) clearance between grid ends and wall.

I. 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.

J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

K. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.

L. Do not eccentrically load system or induce rotation of runners.

3.03 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 095100

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SECTION 096500
RESILIENT FLOORING AND BASE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring and Coved Bases

B. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

C. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.

D. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2026.

E. ASTM F1859 - Standard Specification for Rubber Sheet Floor Covering Without Backing; 2021a.

F. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021 (Reapproved 2025).

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

H. UL 2824 - GREENGUARD Certification Program Method for Measuring Microbial Resistance from Various Sources Using Static Environmental Chambers; Current Edition, Including All Revisions.

1.04 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; certifications from either Greenguard for Children & Schools, or FloorScore indoor emissions testing program; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Samples for Selection: Submit manufacturer's complete set of color samples for Architect's initial selection.

E. Samples for Verification: Submit two samples, 6 by 6 inch (___ by ___ mm) in size illustrating color and pattern for each resilient flooring product specified.

F. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of subfloor is acceptable.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 100 square feet (_____ square meters) of each type and color.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Vinyl Sheet Flooring - Type SV-1: Heterogenous, transparent or translucent vinyl wear layer over interlayer and backing.
   1. Manufacturers:
      a. Basis-of-Design: Tarkett Flooring; Heterogeneous Sheet Vinyl: www.tarkett.com/#sle.
   2. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous backing.
   3. VOC Content Limits: As specified in Section 016116.
   4. Printed Interlayer: High-definition.
   5. Wear Layer Thickness: 0.032 inch (____ mm) minimum.
   6. Total Thickness: 0.080 inch (2.0 mm) minimum.
   7. Sheet Width: 78 inch (____ mm) minimum.
   8. Coved Base: 4 inches high
   9. Static Load Resistance: 250 psi (___ kPa) minimum, when tested as specified in ASTM F970.
   10. Seams: Heat welded.
   11. Pattern: Acczent Woods and Stones Variant Oak.
   12. Color: #037 Nut WB.

B. Vinyl Sheet Flooring - Type SV-2: Heterogenous, transparent or translucent vinyl wear layer over interlayer and backing.
   1. Manufacturers:
      a. Basis-of-Design: Tarkett Flooring; Heterogeneous Sheet Vinyl: www.tarkett.com/#sle.
   2. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous backing.
   3. VOC Content Limits: As specified in Section 016116.
   4. Printed Interlayer: High-definition.
   5. Wear Layer Thickness: 0.032 inch (____ mm) minimum.
   6. Total Thickness: 0.080 inch (2.0 mm) minimum.
   7. Sheet Width: 78 inch (____ mm) minimum.
   8. Coved Base: 4 inches high
   9. Static Load Resistance: 250 psi (___ kPa) minimum, when tested as specified in ASTM F970.
   10. Seams: Heat welded.
   11. Pattern: Acczent Stones.
   12. Color: #026 Beige CB Terrazzo Concrete.

C. Vinyl Sheet Flooring - Type SV-3: Heterogenous, transparent or translucent vinyl wear layer over interlayer and backing.
   1. Manufacturers:
      a. Basis-of-Design: Tarkett Flooring; Heterogeneous Sheet Vinyl: www.tarkett.com/#sle.
   2. Minimum Requirements: Comply with ASTM F1303, Type I, with Class A fibrous backing.
   3. VOC Content Limits: As specified in Section 016116.
   4. Printed Interlayer: High-definition.
   5. Wear Layer Thickness: 0.032 inch (____ mm) minimum.
   6. Total Thickness: 0.080 inch (2.0 mm) minimum.
   7. Sheet Width: 78 inch (____ mm) minimum.
   8. Static Load Resistance: 250 psi (___ kPa) minimum, when tested as specified in ASTM F970.
   9. Seams: Heat welded.
   10. Cove Base: 6 inch high in Restrooms and Shower rooms.
   11. Pattern: Acczent Wood and Stones.
   12. Color: #023 CB Warm Grey Concrete.

D. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Adhesive for Vinyl and Vinyl Flooring:

D. Moldings, Transition and Edge Strips: Metal.
   1. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

B. Prohibit traffic until filler is fully cured.

C. Clean substrate.

D. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:
   1. Fit joints and butt seams tightly.
   2. Set flooring in place, press with heavy roller to attain full adhesion.

D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Metal Strips: Attach to substrate before installation of flooring using stainless steel screws.

E. Spread only enough adhesive to permit installation of materials before initial set.

F. Fit joints and butt seams tightly.

G. Set flooring in place, press with heavy roller to attain full adhesion.

H. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

I. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.05 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION 096500

SECTION 096566
RESILIENT ATHLETIC FLOORING

PART 1.0- GENERAL

1.01 REFERENCE STANDARDS

A. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023, with Editorial Revision (2024).

B. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2025.

C. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

D. ASTM D3389 - Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader); 2021.

E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2023.

F. ASTM E303 - Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester; 2022.

G. ASTM E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine; 2025.

H. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.

I. ASTM E2179 - Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors; 2025.

J. ASTM F925 - Standard Test Method for Resistance to Chemicals of Resilient Flooring; 2013 (Reapproved 2020).

K. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2022.

L. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.02 SUMMARY

A. The work of this section includes:
   1. Ecore Motivate Class I Composition Rubber Back Sheet Vinyl
      a. Baller
   2. Weld Rod

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. See Part 2.0 PROPRIETARY MANUFACTURER/PRODUCTS below

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide Motivate Class I Vulcanized Composition Rubber back sheet vinyl resilient flooring, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.05 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer’s guide specifications product sheet, for specified products.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

E. Quality Assurance Submittals: Submit the following:
   1. Certificates: If required, certification of performance characteristics specified in this document shall be provided by the manufacturer.
   2. Manufacturer's Instructions: Manufacturer's installation instructions.

F. Closeout Submittals: Submit the following:
   1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operational Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
   2. Warranty: Warranty documents specified herein.

1.06 QUALITY ASSURANCE

A. Qualifications:
   1. Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
   2. Manufacturer's Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer-approved installation methods. Obtain Owner and Architect's acceptance of finish color, texture and pattern, and workmanship standard. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.
   1. Mock-Up Size: 10 feet by 10 feet with transition between adjacent materials.
   2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.

C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions and manufacturer's warranty requirements.

1.07 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.08 PROJECT CONDITIONS

A. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during and after installation as recommended by manufacturer.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1.10 MAINTENANCE

A. Extra Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.
   1. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra materials.
   2. Cleaning: Furnish flooring manufacturer's neutral cleaner for initial cleaning and maintenance of finished floor surface.

PART 2.0 – MANUFACTURER - PRODUCTS

2.01 MANUFACTURER: ECORE

A. Address: 715 Fountain Ave., Lancaster, PA 17601; Telephone: (800) 322-1923,
   1. (717) 295-3400; Fax: (717) 295-3414; Email: info@ecoreintl.com

2.02 PROPRIETARY PRODUCT(S)

A. Flooring is manufactured by Ecore.
   1. Ecore Motivate Class I Composition Rubber Back Sheet Vinyl
      a. Baller
   2. Weld Rod
      a. .1 Ecore Motivate Class I Vulcanized Composition Rubber Back Vinyl Sheet Flooring

Ecore Motivate Class I Vulcanized Composition Rubber Back Vinyl Sheet Flooring Baller 5mm Base Layer / 2mm Surface Wear Layer Made from a formulation of high quality post-consumer Vulcanized Composition Rubber granules encapsulated in a wear and water-resistant elastomeric network fusion bonded to a heterogeneous vinyl wear layer with a urethane topcoat		
Performance Criteria	Test Method	Typical Result
Static Load Limit	ASTM F970 @ 250PSI	0.007"
Slip Resistance / Coefficient of Friction	ASTM D2047	??? 0.8
Chemical Resistance	ASTM F925	Good
Abrasion Resistance	ASTM D3389 / EN 649	Pass
Chair Casters	ASTM D6962 BS EN 985	Pass
Flammability - Critical Radiant Flux	ASTM E648 / NFPA 253	Class I
Flammability - "Pill Test"	ASTM D2859	Pass
Resistance to Light	ASTM F-1515 / ISO 105-B02	Pass
Resistance to Heat	ASTM F1514	Pass
VOC's / FloorScore / CHPS / CA 01350	ASTM D-5116	Pass

Recycled Content	Manufacturer	60%	
Dynamic Rolling Load	ASTM F2753	Pass	
g-max	Clegg	343 Average	
Force Reduction (20 kg mass)	ASTM F2569 / EN 14808	Class 1	
Vertical Deflection / Deformation	ASTM F2157 / EN 14809	Pass	
Vertical Ball Rebound	ASTM F2117 / EN 12235	Pass	
Surface Slip Resistance	ASTM E303 / EN-13036	Pass	
Impact Insulation Class (IIC)	ASTM E492	55	(6" concrete, no ceiling)
Airborne Sound Transmission (STC)	ASTM E90	52	(6" concrete, no ceiling)
Delta IIC (floor coverings)	ASTM E2179	23	(6" concrete, no ceiling)
Noise Reduction Coefficient (NRC)	ASTM C423	0.10	
High Frequency IIC (HIIC)		60	(6" concrete, no ceiling)
Delta HIIC		31	(6" concrete, no ceiling)
Sounds Absorption Average (SAA)		0.07	
Roll Dimensions	Manufacturer	Thickness 7mm x Width 70in (1.78m)	
Standard Tolerance Width	Manufacturer	Width: +3/4in (19mm); - 0 in	
Standard Tolerance Length	Manufacturer	Length: +1%; - 0%	
Standard Tolerance Thickness	Manufacturer	Thickness: ± 0.4 mm	

2.3.2 ECORE MOTIVATE CLASS I BALANCED, BALLER, RESTORATIVE AND SERENITY WELD ROD

Ecore Motivate Class I Baller Weld Rod	
Material	Vinyl
Dimensions	3mm diameter rod x 166 LF spool.

a. PRODUCT SUBSTITUTIONS

B. Substitutions: No substitutions permitted.
   a. RELATED MATERIALS

C. Related Materials: Refer to other sections listed in Related Sections paragraph herein for related materials.
   a. SOURCE QUALITY

D. Source Quality: Obtain Vinyl Composition Rubber Back resilient flooring materials from a single manufacturer.

PART 3.0 - EXECUTION

4.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.
    a. EXAMINATION

B. 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.
    a. PREPARATION

C. Surface Preparation: Prepare subsurface material per manufacturer's installation instructions and recommendation.
    a. ERECTION/INSTALLATION/APPLICATION/CONSTRUCTION

D. Rubber Back Vinyl Flooring Installation: Comply with Ecore Technical Manual for installation procedures and techniques.

E. Finish Color/Textures/Patterns: Baller Class 1 Motivate. Color: TBD by Owner.

F. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein for related products installation.

4.02 FIELD QUALITY REQUIREMENTS

A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer's instructions.

4.03 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.
    a. PROTECTION

B. Protection: Protect installed product and finish surfaces from damage during construction.
    a. SCHEDULES

C. Schedules: See Finish Schedule and Finish Plan.

END OF SECTION 096566

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SECTION 096568
RESILIENT ATHLETIC SURFACING

PART 1.0- GENERAL

1.01 REFERENCE STANDARDS

A. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine; 2025.

B. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

1.02 SUMMARY

A. The work of this section includes:
   1. Ecore Athletic RageTurf NIL Rolls

B. Related Sections: Section(s) related to this section include:
   1. Concrete Substrate: Division 3 Concrete Section(s)
   2. Plywood Substrate: Division 6

1.03 REFERENCES

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title, or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. American Society for Testing and Materials (ASTM):
   1. See Part 2.0 PROPRIETARY MANUFACTURER/PRODUCTS below.

1.04 SYSTEM DESCRIPTION

A. Performance Requirements: Provide Ecore Athletic turf, which has been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

1.05 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit product data, including manufacturer’s guide specifications product sheet, for specified products.

C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, patterns, and textures.

D. Samples: Submit selection and verification samples for finishes, colors, and textures.

E. Quality Assurance Submittals: Submit the following.
   1. Provide manufacturer’s current installation guidelines.
   2. Certificates: If required, certification of performance characteristics specified in this document shall be provided by the manufacturer.
   3. Manufacturer’s Field Reports: manufacturer’s field reports specified herein.

F. Closeout Submittals: Submit the following.
   1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operational Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
   2. Warranty: Warranty documents specified herein.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. Installer Qualifications: Installer experienced in performing work of this section, who has specialized in installation of work similar to that required for this project.
    a. Confirmation: When requested, submit confirmation indicating qualification.
2. Manufacturer's Qualifications: Manufacturer capable of providing field service representation during construction and approving application method.

B. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer-approved installation methods. Obtain owner and architect's acceptance of finish color, texture and pattern, and workmanship standard. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.
1. Mock-Up Size: specify mock-up size.
2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
3. Incorporation: Mock-up may be incorporated into final construction upon owner's approval.

C. Pre-installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's instructions, and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.

D. Pre-installation Testing: Conduct pre-installation testing as follows: specify substrate testing; consult with flooring manufacturer.

1.07 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials at temperature and humidity conditions recommended by manufacturer and protect from exposure to harmful weather conditions.

1.08 PROJECT CONDITIONS

A. Temperature Requirements: Maintain air temperature in spaces where products will be installed for time period before, during, and after installation as recommended by manufacturer.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for owner's acceptance, manufacturer's standard warranty document, executed by authorized company official.
1. Warranty Period: Specify term years commencing from Date of Substantial Completion.

1.10 MAINTENANCE

A. Extra Materials: Deliver to owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 1 Closeout Submittals (Maintenance Materials) Section.
1. Quantity: Furnish quantity of Flooring units equal to specify % of amount installed.
2. Delivery, Storage, and Protection: Comply with owner's requirements for delivery, storage, and protection of extra materials.
3. Cleaning: Furnish flooring manufacturer's neutral cleaner for initial cleaning and maintenance of the finished floor surface.

PART 2.0 - MANUFACTURER/PRODUCTS

2.01 MANUFACTURER: ECORE

A. Address: 715 Fountain Ave., Lancaster, PA 17601; Telephone: (866) 795-2732,
   1. (717) 295-3400; Fax: (717) 295-3414; Email: info@ecoreintl.com

2.02 PROPRIETARY PRODUCT(S)

A. 1. Ecore Athletic RageTurf NIL rolls
   1. Ecore Athletic RageTurf NIL Turf Rolls with 10mm Vulcanized Composition Rubber ShockPad

Ecore Athletic RageTurf NIL rolls consisting of 12mm (approx. 7/16”) pile height polyethylene turf surface layer with 5mm foam backing, field-united with a 10mm vulcanized composition

rubber ShockPad.

Performance Criteria	Test Method	Typical Results (with 10mm ShockPad)
Turf Sheet Dimensions	Manufacturer	Overall thickness: 17mm (approx.11/16"). Width: 15’. Length: Custom Length
ShockPad Sheet Dimensions	Manufacturer	4’ wide by custom length
Turf Sheet Weight	Manufacturer	0.98 lbs/sf / 4.78 kg/m2
10mm ShockPad Weight	Manufacturer	1.32 lbs/sf
Total System Weight with 10mm ShockPad	Manufacturer	2.30 lbs/sf
Turf Sheet Standard Tolerances	Manufacturer	Roll width: +3/4”, - 0”; Roll length: +1%, - 0”
ShockPad Standard Tolerance Length	Manufacturer	+1% -0”
Coefficient of Friction	ASTM D2047	>0.8
Force Reduction	Deltec Field Tester	61.8%
Energy Restitution	Deltec Field Tester	26.9%
Vertical Deformation	Deltec Field Tester	7.0mm
G-Max	Clegg	102
Flammability – Pill Test	ASTM D2859	Pass
VOC Compliant	CA 01350	Pass

PART 3.0 - EXECUTION

3.01 MANUFACTURER’S INSTRUCTIONS

A. Compliance: Comply with manufacturer’s product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.02 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.

3.03 PREPARATION

A. Surface Preparation: specify applicable product preparation requirements.

3.04 ERECTION/INSTALLATION/APPLICATION/CONSTRUCTION

A. Vulcanized Composition Rubber: Comply with the Ecore Athletic Technical Manual for installation procedures and techniques.

B. Turf: Comply with the Ecore Athletic Technical Manual for installation procedures and techniques.

C. Finish Color/Textures/Patterns: Rage Turf NIL with custom pattern. Color TBD by Owner.

D. Related Products Installation: Refer to other sections listed in Related Sections paragraph herein.

3.05 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.06 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

3.07 SCHEDULES

A. Schedules: See Finish Plan and Schedule.

END OF SECTION 096568

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied flooring.

B. Section 09 6519 - Resilient Tile Flooring

1.03 REFERENCE STANDARDS

A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.

B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available; conpliance with the Carpet and Rug Institute Green Label Plus program; and method of installation.

C. Samples for Verification: Submit a minimum of two carpet tiles illustrating full range of color and pattern design for each carpet type selected.

D. Submit two, 6 inch (____ mm) long samples of edge strip.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 2 percent of total installed of each color and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum 10 years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 48 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Mohawk Group, www.mohawkind.com
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type CPT: Tufted, manufactured in one color dye lot.
   1. Basis of Design Product: First Step II GT315 manufactured by Mohawk Group, Mohawk Industries.
   2. Tile Size: 24x24 inch (____by____ mm), nominal, or manufacturer's standard.
   3. Color: #983 Iron Ore.
   4. Installation Pattern: Brick Ashlar.
   5. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Edge Strips: Embossed aluminum, color as selected by Architect.

C. Recess Floor at Vestibule to allow for same elevation with adjacent floor finish on slab.

D. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

D. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in ashler pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Locate change of color or pattern between rooms under door centerline.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION 096813

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SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Exposed surfaces of steel lintels and ledge angles.
   2. Mechanical and Electrical:
      a. On the roof and outdoors, paint equipment that is exposed to weather or to view, unless specifically excluded elsewhere..

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Brick.
   7. Prefinished metal wall and roof panels.
   8. Glass.
   9. Concrete masonry units in <> spaces.
   10. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 07 9200 - Sealants.

D. Section 099123 - Interior Painting.

E. Section 09 9723 - Graffiti Coatings.

F. Section 210553 - Identification for Fire Suppression Piping and Equipment: Painted identification.

G. Section 230553 - Identification for HVAC Piping and Equipment: Painted identification.

H. Section 260553 - Identification for Electrical Systems: Painted identification.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning; 2024.

G. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.05 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(s) product is to be used in; include description of each system.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect.
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry and metal roofing, have been approved.

D. Samples: Submit two paper chip samples, 8.5 x 11 inch (____by____ mm)es in size illustrating range of colors available for each surface finishing product scheduled.

E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

F. Manufacturer's Instructions: Indicate special surface preparation procedures.

G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum ten years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 MOCK-UPS

A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

B. Provide door and frame assembly illustrating paint color, texture, and finish.

C. Locate where directed by Architect.

D. Mock-up may remain as part of the work.

1.08 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.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Pittsburgh Paints: www.pittsburghpaints.com/#sle.
   2. Basis of Design Colors: Benjamin-Moore: www.benjaminmoore.com.
   3. Rodda Paint Company: www.roddapaint.com.
   4. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.

C. Transparent Finishes:
   1. Behr Process Corporation; _____: www.behr.com/#sle.
   2. Benjamin-Moore: www.benjaminmoore.com.
   3. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.
   4. Rodda Paint Company: www.roddapaint.com.

D. Stains:
   1. Behr Process Corporation; _____: www.behr.com/#sle.
   2. Benjamin-Moore: www.benjaminmoore.com.
   3. Sherwin-Williams Company; _____: www.sherwin-williams.com/#sle.
   4. Rodda Paint Company: www.roddapaint.com.

E. Primer Sealers: Same manufacturer as top coats.

F. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
   2. 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.

3. 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.
4. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
5. Supply each paint material in quantity required to complete entire project's work from a single production run.
6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

C. Colors: As indicated in Color Schedule.
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 PAINT SYSTEMS - EXTERIOR

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including fiber cement siding and primed metal.
1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
3. Top Coat Sheen:
   a. Eggshell: MPI gloss level 3; use this sheen at all locations.
4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint E-TR-W - Stain on Wood:
1. 2 coats stain.
2. Stain: Exterior Semi-Transparent Stain for Wood, Water Based; MPI #156.
   a. Products:
      1) Behr Premium Semi-Transparent Weatherproofing Wood Stain No. 5077 Tint Base.
      2) Substitutions: Section 016000 - Product Requirements.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Fiber Cement Siding: 12 percent.
2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

I. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
   3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

J. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

K. Exterior Wood to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior calking compound after sealer has been applied. Prime concealed surfaces.

L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Sand wood and metal surfaces lightly between coats to achieve required finish.

H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

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

B. Owner will provide field inspection.

3.05 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 COLOR SCHEDULE

A. Refer to exterior Elevation drawing for exterior color selections.

END OF SECTION 099113

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.
   1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
   2. Mechanical and Electrical:
      a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Floors, unless specifically indicated.
   7. Ceramic and other tiles, and grout.
   8. Brick.
   9. Glass.
   10. Acoustical materials, unless specifically indicated.
   11. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 016116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 055000 - Metal Fabrications: Shop-primed items.

C. Section 055100 - Metal Stairs: Shop-primed items.

D. Section 07 9200 - Sealants.

E. Section 099113 - Exterior Painting.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

D. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

E. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.05 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.
   4. Manufacturer's installation instructions.
   5. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.
   2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
   3. Allow 30 days for approval process, after receipt of complete samples by Architect.
   4. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Paint and Finish Materials: 1 gal (4 L) of each color; from the same product run, store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum ten years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.07 MOCK-UP

A. See Section 014000 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 4 feet (____ m) long by 4 feet (____ m) wide, illustrating paint color, texture, and finish.

C. Provide door and frame assembly illustrating paint color, stain color, texture, and finish.

D. Locate where indicated on drawings.

E. Mock-up may remain as part of the work.

1.08 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.

1.09 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior, unless required otherwise by manufacturer's instructions.

F. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:
   1. Pittsburgh Paints: www.pittsburghpaints.com/#sle.
   2. Benjamin-Moore: www.benjaminmoore.com.
   3. Rodda Paint Co: www.roddapaint.com.
   4. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

C. Transparent Finishes:
   1. Benjamin-Moore: www.benjaminmoore.com.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   3. Rodda Paint Co: www.roddapaint.com.

D. Stains:
   1. Benjamin-Moore: www.benjaminmoore.com.
   2. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
   3. Rodda Paint Co: www.roddapaint.com.

E. Primer Sealers: Same manufacturer as top coats.

F. Substitutions: See Section 016000 - Product Requirements.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks, runs or sags.
   2. Supply each paint material in quantity required to complete entire project's work from a single production run.
   3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: See Section 016116.

C. Flammability: Comply with applicable local, state and federal codes for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: As indicated on drawings.
   1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
   2. Extend colors to surface edges; colors may change at any edge as directed by Architect.
   3. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.
   4. Refer to Gym Striping plans on drawings for center logo, court striping colors and layout.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, wood, shop primed steel, and galvanized steel.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.
   3. Top Coat Sheen:
      a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
      b. Satin: MPI gloss level 4; use this sheen at walls.
      c. Semi-Gloss: MPI gloss level 5; use this sheen at doors and door frames..

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, and guardrails.
   2. Two top coats and one coat primer.
   3. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.

C. Paint I-OP-MD-WC - Medium Duty Vertical and Overhead: Including gypsum board, shop primed steel, and galvanized steel.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Interior Epoxy-Modified Latex; MPI #115 or 215.

D. Paint I-TR -W - Transparent Finish on Wood.
   1. 1 top coat over sanding sealer over stain.
   2. Stain: Semi-Transparent Stain for Wood; MPI #90.
      a. Products:
         1) Sherwin-Williams Wood Classics 250 VOC Oil Stain. (MPI #90)
         2) Substitutions: Section 016000 - Product Requirements.
   3. Sealer: Alkyd, Sanding Sealer, Clear; MPI #102.
   4. Top Coat Sheen:

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 or 3 X-Green.
   2. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
   3. Interior Latex Primer Sealer; MPI #50 or 50 X-Green.
   4. Interior Drywall Primer Sealer.
   5. Interior Rust-Inhibitive Water Based Primer; MPI #107.
   6. Interior Water-Based Primer for Galvanized Metal; MPI #134 or 134 X-Green.
   7. Latex Primer for Interior Wood; MPI #39.

2.05 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. 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. Masonry:
   1. Prepare surface as recommended by top coat manufacturer.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Galvanized Surfaces:

H. 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.

I. 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.

J. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

K. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

L. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

M. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Wood to Receive Transparent Finishes: See Section 099300.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

A. Protect finishes until completion of project.

END OF SECTION 099123

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Corner guards.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications: Corner guards fabricated from rolled metal sections or bent plate.

B. Section 061000 - Rough Carpentry: Blocking for wall and corner guard anchors.

C. Section 092116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

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 F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2023.

D. 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, wall mounting brackets with mounted measurements, 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.

D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.
   1. Submit two sections of corner guards, bumper rails, and protective corridor handrails, 6 inches (_____ mm) long.

E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.

B. Protect work from moisture damage.

C. Protect work from UV light damage.

D. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in compliance with manufacturer's recommendations for each type of item.

E. Store products in either horizontal or vertical position, in compliance with manufacturer's instructions.

1.06 WARRANTY

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

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.

2.02 PRODUCT TYPES

A. Corner Guards - Surface Mounted:
   1. Material: Type 304 stainless steel, No. 4 finish, 16 gage, <> inch (_____ mm) thick.
   2. Thickness: 0.075 inch (1.9 mm).
   3. Width of Wings: 2 inches (51 mm).
   4. Corner: Square.
   5. Color: As indicated.
   6. Length: One piece, 48 inches (1219 mm).
   7. Mounting: Countersunk screws through factory-drilled holes.

B. Adhesives and Primers: As recommended by manufacturer.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

B. Verify that substrate surfaces for adhered items are clean and smooth.

3.02 INSTALLATION

A. Position corner guard 4 inches (102 mm) above finished floor to 48 inches high (____ mm high).

3.03 TOLERANCES

A. Maximum Variation From Required Height: 1/8 inch (____ mm).

B. Maximum Variation From Level or Plane For Visible Length: 1/8 inch (____ mm).

3.04 CLEANING

A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

END OF SECTION 102600

SECTION 102800
TOILET, BATH AND CUSTODIAL ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.
   1. **ALL ACCESSORIES PROVIDED BY OWNER, INSTALLED BY OWNER.**

B. Accessories for toilet rooms and showers.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.

B. Section 102113.19 - Plastic Toilet Compartments.

C. Section 224000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2025.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2025a.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017 (Reapproved 2022).

F. ASTM C1036 - Standard Specification for Flat Glass; 2025.

G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

H. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

I. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2022.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 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.

C. Samples: Submit one sample of each accessory, illustrating color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Bobrick.

B. Basis of Design: Kimberly Clark- Owner supplier provided accessories.

C. Commercial Toilet, Shower, and Bath Accessories:
   1. ASI - American Specialties, Inc: www.americanspecialties.com.

2. Bradley Corporation: www.bradleycorp.com.
3. Substitutions: Section 016000 - Product Requirements.

D. **Owner Furnished/Contractor Installed Accessories:**
1. Toilet paper dispensers: MOD #39732
2. Paper Towel Dispenser: MOD #31498
3. Soap Dispensers - MOD #32508
4. Toilet Seat Cover Dispensers: Series-I In-Sight #09506
5. Waste receptacle: MOD #35370

E. Provide products of each category type by single manufacturer.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 3 keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

G. Adhesive: Contact type, waterproof.

H. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

C. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.

D. Back paint components where contact is made with building finishes to prevent electrolysis.

2.04 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick annealed float glass; ASTM C1036.
1. Tempered safety glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: As indicated on drawings.
3. Frame: 0.05 inch (1.3 mm) channel shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
4. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.
5. Shelf: Stainless steel; gauge and finish to match mirror frame, turned down edges, welded to frame; 5 inches (125 mm) deep, full width of mirror.
6. Product: B-165 manufactured by Bobrick.
7. **OWNER PROVIDED CONTRACTOR INSTALLED**

B. Grab Bars: Stainless steel, smooth surface.
1. Standard Duty Grab Bars:
a. Push and Pull Point Load: Minimum 250 lbf (1112 N).
b. Dimensions: 1-1/4 inch (32 mm) outside diameter, minimum 18-gauge, 0.05-inch (1.02 mm) steel thickness, exposed flange mounting, 1-1/2 inch (38 mm) clearance between wall and inside of grab bar.
c. Finish: Satin.
d. Length and Configuration: As indicated on drawings.

e. **OWNER PROVIDED, CONTRACTOR INSTALLED**
f. Products:
1) B-5806 Series Grab Bars by Bobrick.

2.05 SHOWER ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch (25 mm) outside diameter, 0.04 inch (1.0 mm) wall thickness, satin-finished, with 3 inch (75 mm) outside diameter, minimum 0.04 inch (1.0 mm) thick satin-finished stainless steel flanges, for installation with exposed fasteners.
1. Product: B-6107 x 36 manufactured by Bobrick.
2. **OWNER PROVIDED, CONTRACTOR INSTALLED**

B. Shower Curtain: **OWNER PROVIDED, CONTRACTOR INSTALLED**
1. Material: Manufacturer standard, machine washable, stain and mildew-resistant, with mesh band at ceiling. NFPA 701 Compliant.
2. Size No less than 10% wider than track length
a. Finish bottom hem no less than 10 inches above finish floor.
3. Grommets: Stainless steel; pierced through top hem on 6 inch (150 mm) centers.
4. Color: As selected from manufacturer's standard colors.
5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.
1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of white color.
2. Size: ADA Standards compliant.
3. Basis of Design Product: B-918116 manufactured by Bobrick.
a. **PROVIDED BY OWNER, CONTRACTOR INSTALLED**

D. Towel Bar: Stainless steel, 1 inch (___ mm) round tubular bar; <> brackets, concealed attachment, satin finish.
1. Length: 18 inches (460 mm).
2. Products:
a. B-530 Series by Bobrick.
b. **OWNER PROVIDED, CONTRACTOR INSTALLED**

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.

3.04 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 102800

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SECTION 104300
EMERGENCY AID SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Automated external defibrillators (AEDs).

B. Automated external defibrillator (AED) cabinets.

C. First aid cabinets.

D. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 061000 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 099123 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2026.

1.04 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. Stryker Corporation; HeartSine samaritan PAD 350P Defibrillator - PAD 350p: www.stryker.com/#sle.

B. Emergency Aid Cabinets and Accessories:
   1. Activar Construction Products Group, Inc. - JL Industries; LifeStart 1400 Series AED Cabinet: www.activarcpg.com/#sle.

2.02 AUTOMATED EXTERNAL DEFIBRILLATORS (AEDS)

A. Automated External Defibrillators (AEDs) - General: FDA approval required.

2.03 EMERGENCY AID CABINETS

A. Type: Automated external defibrillator (AED).

B. Cabinet Construction: Non-fire-rated.
   1. Formed primed steel sheet; 0.036 inch (0.9 mm) thick base metal.

C. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate AED.
   2. Trim: Flat rolled edge, with ____ inch (____ mm) wide face.

D. 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.

2.04 ACCESSORIES

A. Theft Alarm: Battery operated audible and strobe light alarm, 10 second delay for disarming, activated by opening cabinet door. Alarm deactivated when door is closed.

B. Alarm Contacts: Contact devices.
   1. Magnetic door contact for existing alarm systems.

C. Cabinet Door Signage: 'AED” decal, or vinyl self-adhering, prespaced black lettering and identifying graphic in accordance with authorities having jurisdiction (AHJ).

D. Plastic Wall Signage: Flat style.

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. Wall Signs:
   1. Location: Where shown.
   2. Apply on walls after field painting is completed and has been accepted.

C. Cabinet Lettering:
   1. Location: Face of door framing.

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. Demonstrate proper operation of AED to Owner's designated representative.

END OF SECTION 104300

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.

1.03 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.

D. Manufacturer's Instructions: Indicate special criteria and wall opening coordination requirements.

E. Operation and Maintenance Data: Include test, refill, or recharge schedules and recertification requirements.

1.04 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature causes freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Extinguishers:
   1. Kidde, a unit of United Technologies Corp: www.kidde.com.
   2. Pyro-Chem, a Tyco Business: www.pyrochem.com.
   3. Larsen's Manufacturing Co; www.larsensmfg.com/#sle.<>
   4. Substitutions: See Section 016000 - Product Requirements.

B. Fire Extinguisher Cabinets and Accessories:
   1. Kidde, a unit of United Technologies Corp; <>: www.kidde.com.
   2. Basis of Design: Larsen's Manufacturing Co; Architectural Series-#2409-6R: www.larsensmfg.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 FIRE EXTINGUISHERS

A. General Requirements: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry-Chemical-Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C.
   2. Size: 5 pound (2.27 kg).
   3. Finish: Baked polyester powder coat, red color.

2.03 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: Vertical, Die-Cut, Color: Red..

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. Notify Architect in writing of conditions detrimental to completion of work. Do not proceed with installation until detrimental conditions are corrected.

D. Verify rough openings for cabinet are sized and located in accordance with manufacturer's written instructions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, mount as indicated.

C. Secure rigidly in place.

D. Place extinguishers and accessories in cabinets.

END OF SECTION 104400

SECTION 113013
APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. ALL APPLIANCES PROVIDED BY OWNER. FOR REFERENCE ONLY.

B. OWNER PROVIDED - CONTRACTOR INSTALLED.

1.02 RELATED REQUIREMENTS

A. Section 221005 - Plumbing Piping: Plumbing connections for appliances.

B. Section 260583 - Wiring Connections: Electrical connections for appliances.

1.03 REFERENCE STANDARDS

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

1.04 SUBMITTALS

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

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

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. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.06 WARRANTY

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

B. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

C. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

D. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Refrigerator : Free-standing, bottom-mounted freezer <>.
   1. Exterior Finish: Stainless steel.
   2. Teaching Kitchen.
   3. Manufacturers:
      a. Basis of Design - GE Profile Series Energy Star 22.1 Cu. Ft. counter-depth French-Door Refrigerator #PY#22KYN..

B. Microwave: Countertop.
   1. Exterior Finish: Stainless steel.
   2. GE Profile Series 2.2 Cu. Ft. Countertop Sensor Microwave Oven
   3. Manufacturers:
      a. GE Appliances; Profile #PCST22U1WSS: www.geappliances.com.

C. Waste Disposer: <>, corded, <>.
   1. Power: 1/2 HP.
   2. GE 1/2 Horsepower Continuous-Feed Disposer
   3. Manufacturers:
      a. GE Appliances; GFC525N: www.geappliances.com/#sle.

D. Dishwasher: <>.
   1. Finish: Stainless steel .
   2. GE Profile Series Stainless Steel Interior Dishwasher with Microban Antimicrobial Technology. Normal Height Countertops. #PDP715SYV
   3. ADA height Countertop: GE Stainless Steel Interior Dishwasher with hidden Controls. #GDT226S
   4. Manufacturers:
      a. GE Appliances; PDP715SYV: www.geappliances.com.

2.02 OTHER EQUIPMENT

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION 113013

SECTION 122400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Window shades and accessories.

1.02 RELATED REQUIREMENTS

A. Section : Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene prior to commencing work related to products of this section; require attendance of all affected installers.

B. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section , for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Shop Drawings: Include .

D. Selection Samples: Include .

E. Verification Samples: Minimum size square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing work of this type with minimum five years of documented experience.

1.07 MOCK-UP

A. Mock-Up: Provide mock-up of window shade complete with selected shade fabric including sample of seam when applicable.
   1. Obtain Architect's approval of light and privacy characteristics of fabric prior to fabrication.
   2. Full-sized mock-up may become part of the final installation.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.09 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

A. See Section , for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:
   1. Shade Hardware:
   2. Fabric:

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Type WC-1 - Manually Operated Roller Shades:
   1. Draper, Inc: www.draperinc.com/#sle.
   2. Hunter Douglas; Roller Shades FR: www.hunterdouglas.com.
   3. Substitutions:

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

C. Provide shades to match existing building with manufacturer and style.

2.02 WINDOW SHADE APPLICATIONS

A. Shades: Light controlling.
   1. Fabric Performance Requirements:
      a. Openness Factor: 1%.
   2. Color: As selected by Architect from manufacturer’s full range of colors.
   3. Mounting: Inside (between jambs).
   4. Operation: Manual.

2.03 ROLLER SHADES

A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories.
   1. Size:

B. Fabric: Non-flammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
   1. Privacy Shades: Soften the light yet still reveal some details to the outside; moderate privacy; Openness Factor approximately equal to 1 percent.
   2. Flammability: Pass NFPA 701 large and small tests.

C. Roller Tubes: As required for type of operation.
   1. Finish: Baked enamel; color from manufacturer's standards.

D. Hembars: Designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.

E. Manual Operation for Interior Shades: ; .

2.04 ACCESSORIES

A. Fascias: Size as required to conceal shade mounting.
   1. Style: As selected by Architect from shade manufacturer’s full selection.
   2. Material and Color: To match shade.

B. Brackets and Mounting Hardware: As recommended by manufacturer for mounting configuration and span indicated.

C. Number Plates: Number each opening and shade. Provide aluminum number plates for each shade unit and each opening. Fasten shade plate to the back of roller. Fasten opening plate on unexposed surface of the opening.

D. Fasteners: Non-corrosive, and as recommended by shade manufacturer.

2.05 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with space between bottom bar and .
   2. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 0.125 inches (___ mm) total.

C. Dimensional Tolerances: As recommended in writing by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Installation Tolerances:
   1. Inside Mounting: Maximum space between shade and jamb when closed of 1/8 inch (___ mm).
   2. Maximum Offset From Level:

C. Adjust level, projection and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 CLOSEOUT ACTIVITIES

A. See Section , for closeout submittals.

B. Demonstration: Demonstrate operation and maintenance of window shade system to Owner's personnel.

3.06 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

3.07 MAINTENANCE

A. See Section , for additional requirements relating to maintenance service.

END OF SECTION 122400

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SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Wall-hung counters.

1.02 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

E. PS 1 - Structural Plywood; 2023.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements 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. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.04 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.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade Custom Grade, in accordance with AWI/AWMAC/WI (AWS), AWI/AWMAC/WI (AWS), AWMAC/WI (NAAWS), or AWMAC/WI (NAAWS), unless noted otherwise.

B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate. Basis of Design: Corian solid surface, Color: Neutral Concrete, www.corian.com
   1. Flat Sheet Thickness: 3/4 inch (19 mm), minimum.
   2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
      a. Color and Pattern: As indicated on drawings.
   3. Other Components Thickness: 3/4 inch (___ mm), minimum.
   4. Back and End Splashes: Same sheet material, square top; minimum 4 inches (102 mm) high.
   5. Skirts: As indicated on drawings.
   6. Fabricate in accordance with AWI/AWMAC/WI (AWS), AWI/AWMAC/WI (AWS), AWMAC/WI (NAAWS), or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade Premium Grade.

2.02 MATERIALS

A. Wood-Based Components:
   1. Wood fabricated from old growth timber is not permitted.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.
   1. Marine grade exterior glue plywood at wet and exterior locations.

C. Particleboard substrates are not permitted.

D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

E. Joint Sealant: Mildew-resistant silicone sealant, clear.

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.

C. Solid Surfacing: Fabricate tops and wall panels up to 144 inches (3657 mm) long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.
   1. No joints located within 24 inches of sink edges.

D. Wall-Mounted Counters: Provide powder coated steel brackets as indicated on drawings, finished to matchat interior locations. Use stainless steel brackets at exterior locations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach stainless steel countertops using stainless steel fasteners and clips.

C. Apply sealer products in accordance with manufacturer's written instructions.

D. Seal joint between back/end splashes and vertical surfaces.

3.04 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.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

3.07 SCHEDULES

A. All other countertops: Solid Surface: Neutral Concrete.

END OF SECTION 123600

SECTION 22 00 00
PLUMBING BASIC REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included in 22 00 00 applies to Division 22 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of plumbing systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:
   1. Provide: To furnish and install, complete and ready for intended use.
   2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
   3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
   4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01 requirements, and approved by the Engineer prior to submitting bids for substituted items.
   5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.02 RELATED SECTIONS:

A. Contents of Section applies to Division 22 Contract Documents.

B. Related Work:
   1. Additional conditions apply to this Division including, but not limited to:
      a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
      b. Drawings
      c. Addenda
      d. Owner/Architect Agreement
      e. Owner/Contractor Agreement
      f. Codes, Standards, Public Ordinances and Permits

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, individual Division 22 Sections and those listed in this section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
   1. State of Oregon:
      a. OAR Oregon Administrative Rules
      b. OESC Oregon Electrical Specialty Code
      c. OFC Oregon Fire Code

d. OMSC Oregon Mechanical Specialty Code
e. OPSC Oregon Plumbing Specialty Code
f. OSSC Oregon Structural Specialty Code
g. Oregon Elevator Specialty Code

C. General: Reference standards and guidelines include but are not limited to the latest adopted editions from:
1. ADA Americans with Disabilities Act
2. AHRI Air-Conditioning Heating & Refrigeration Institute
3. ANSI American National Standards Institute
4. ASCE American Society of Civil Engineers
5. ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers
6. ASHRAE Guideline 0, the Commissioning Process
7. ASME American Society of Mechanical Engineers
8. ASPE American Society of Plumbing Engineers
9. ASSE American Society of Sanitary Engineering
10. ASTM ASTM International
11. AWWA American Water Works Association
12. CFR Code of Federal Regulations
13. CGA Canadian Gas Association
14. CISPI Cast Iron Soil Pipe Institute
15. CSA CSA International
16. ETL Electrical Testing Laboratories
17. EPA Environmental Protection Agency
18. FDA Food & Drug Administration
19. FM FM Global
20. IAPMO International Association of Plumbing and Mechanical Officials
21. GAMA Gas Appliance Manufacturers Association
22. HI Hydraulic Institute Standards
23. ISO International Organization for Standardization
24. LEED Leadership in Energy and Environmental Design
25. MSS Manufacturers Standardization Society
26. NEC National Electric Code
27. NEMA National Electrical Manufacturers Association
28. NFGC National Fuel Gas Code
29. NFPA National Fire Protection Association
30. NRCA National Roofing Contractors Association
31. NSF National Sanitation Foundation
32. OSHA Occupational Safety and Health Administration
33. SMACNA Sheet Metal and Air Conditioning Contractors' National Association, Inc.
34. TEMA Tubular Exchanger Manufacturers Association
35. TIMA Thermal Insulation Manufacturers Association
36. UL Underwriters Laboratories Inc.
37. USDA United States Department of Agriculture

D. See Division 22 individual sections for additional references.

E. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

F. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

G. Piping Insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials across the board.

1.04 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 22 sections.

B. Provide product submittals and shop drawings in one copy in paper format with electronic backup. Electronic format must be submitted via portable flash drive. For electronic format, provide one zip file per specification division containing a separate file for each specification section. For paper format, provide one common binder per specification division, with tabbed dividers for each specification section. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.

C. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 22 sections.

D. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
   1. Label submittal to match numbering/references as shown in Contract Documents and schedules. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
   2. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference Division 22 Specification sections for specific items required in product data submittal outside of these requirements.
   3. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
   4. For vibration isolation of equipment, list make and model selected with operating load and deflection. Indicate frame type where required. Submit manufacturer's product data.
   5. See Division 22 sections for additional submittal requirements outside of these requirements.
   6. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

E. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-05 Chapter 13 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Refer to structural for building occupancy, seismic design category, and equipment importance factor.

F. Equipment with an importance factor greater than 1.0, and the applicable factor value for each, is indicated on the structural Drawings.

G. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 22 Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26 submittals.

H. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

I. Substitutions and Variation from Basis-of-Design:
   1. Basis-of-Design system components and controls for equipment are selected and sized based on the equipment specified as the first-named manufacturer, model number and supplemental additional options as indicated in the Contract Documents. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid will be allowed for such revisions. Coordinate with the requirements of "Submittals". For any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

J. Shop Drawings: Provide coordinated Shop Drawings which include physical characteristics of all systems, equipment and piping layout plans, and control wiring diagrams. Reference individual Division 22 sections for additional requirements for Shop Drawings outside of these requirements.
   1. Provide Shop Drawings indicating sanitary cleanout locations and type to Architect for approval prior to installation.
   2. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.

K. Samples: Provide samples when requested by individual sections.

L. Resubmission Requirements:
   1. Make any corrections or change in submittals when required. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
      a. Resubmit for review until review indicates no exceptions taken or make "corrections as noted".
      b. When submitting drawings for Engineers re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.

M. Operation and Maintenance Manuals, Owners Instructions:
   1. Submit, at one time, one bound copy of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
      a. Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
      b. Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.
      c. Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub assemblies.
      d. Include copy of startup and test reports specific to each piece of equipment.
      e. Include copy of final water systems balancing log along with pump operating data.
      f. Include commissioning reports.
      g. Include copy of valve charts/schedules.

h. Include Warranty per Division 00 and Division 01, Section 22 00 00 and individual Division 22 sections.
i. Include product certificates of warranties and guarantees.
j. Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

2. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 22 00 00 article titled "Demonstration".
3. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

N. Record Drawings:
1. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.
2. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.
3. At completion of project, input changes to original project on CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD disk and drawings upon substantial completion.
4. Invert elevations and dimensioned locations for water services, building waste, and storm drainage piping below grade extending to 5-feet outside building line.
5. See Division 22 individual sections for additional items to include in record drawings.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State, Federal and other applicable laws and regulations.

B. Drawings are intended to be diagrammatic and reflect the Basis-of-Design manufacturers equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis-of-Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

C. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

D. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

E. UL and CSA Compliance: Provide products which are UL and CSA listed

F. ASME Compliance: ASME listed water heaters and boilers with an input of 200,000 BTUH and higher, hot water storage tanks which exceed 120 gallons, and hot water expansion tanks which are connected to ASME rated equipment or required by code or local jurisdiction.

G. Provide safety controls required by National Boiler Code (ASME CSD 1) for boilers and water heaters with an input of 400,000 BTUH and higher.

1.06 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 01, Section 22 00 00 and individual Division 22 sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty in Division 01 and the General Conditions. Confirm requirements in all Contract Documents.

1.07 COORDINATION DOCUMENTS

A. Advise Architect in the event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

B. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.

C. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide like items from one manufacturer, including but not limited to fixtures, pumps, drains and equipment.

2.02 MATERIALS

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities.

B. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

C. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

D. Hazardous Materials:
   1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
   2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
   3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

2.03 ACCESS PANELS

A. See Division 01, General Requirements and Division 08 for products and installation requirements.

B. Confirm Access Panel requirements in Division 01, Division 08 and individual Division 22 sections. In the absence of specific requirements, comply with the following:
   1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly.
      a. Ceiling access panels to be minimum 24-inch by 24-inch required and approved size.

b. Wall access panels to be minimum of 12-inch by 12-inch required and approved size.
c. Provide screwdriver operated catch provided.
    1) Drywall: Karp KDW.
    2) Plaster: Karp DSC-214PL.
    3) Masonry: Karp DSC-214M.
    4) 2 hour rated: Karp KPF-350FR.
    5) Milcor, Elmdor, Acudor, or approved equivalent.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00, Division 01, Section 22 00 00 and individual Division 22 sections.

B. Install equipment requiring access (i.e., drain pans, drains, control operators, valves, motors, cleanouts and water heaters) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing, and coordination with other trades and disciplines.

D. Earthwork:
    1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 22 Sections and the following:
        a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with the provisions of related earthwork sections/divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
        b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
        c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Firestopping:
    1. Confirm Firestopping requirements in Division 07. In absence of specific requirements, comply with individual Division 22 Sections and the following:
        a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

F. Pipe Installation:
    1. Coordinate work to account for expansion and contraction of piping materials and building as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems.
    2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums:

1. Provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, Section 22 00 00 and individual Division 22 sections.

B. General:
   1. Seismic Design Category: Refer to structural.
   2. Building Category: Refer to structural.
   3. Importance Factor (I-p): Refer to structural.
   4. Earthquake resistant designs for Plumbing (Division 22) equipment and distribution, i.e. motors, plumbing systems, piping, equipment, water heaters, boilers, etc. conform to regulations of jurisdiction having authority.
   5. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
   6. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for piping equipment and water heaters. Submit Shop Drawings along with equipment submittals.
   7. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details. Coordinate exact design requirements with project Structural Engineer.

C. Piping:
   1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

D. Equipment:
   1. Provide means to prohibit excessive motion of plumbing equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Division 01, Section 22 00 00 and individual Division 22 Sections.

B. Notify Architect or Engineer, in writing, at following stages of construction so that Architect may, at their option, visit site for review and construction observation:
   1. Underground piping installation prior to backfilling.
   2. Prior to covering walls.
   3. Prior to ceiling cover/installation.
   4. When main systems, or portions of, are being tested and ready for inspection by AHJ.

C. Bear responsibility and cost to make piping accessible, to expose concealed lines, or to demonstrate acceptability of the system. If Contractor fails to notify Architect at times prescribed above, costs incurred by removal of such work are the responsibility of the Contractor.

D. Final Punch:
   1. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 22 sections and the following:
   1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
   2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new piping, and wiring to point of connection.
   3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
      a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
   4. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 01. In absence of specific requirements, comply with individual Division 22 sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section and will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
   3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
   4. Restore new or existing work that is cut and/or damaged to original condition. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
   5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 22 Sections and the following:
   1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.
   2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
   3. Protect bright finished shafts, bearing housings and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00, Division 01, Section 22 00 00 and individual Division 22 sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, Section 22 00 00 and individual division 22 sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm cleaning requirements in Division 01, Section 22 00 00 and individual Division 22 sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm installation requirements in Division 00, Division 01, Section 22 00 00 and individual Division 22 sections.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
   1. Do not place equipment in sustained operation prior to initial balancing of plumbing systems.
   2. Provide pump impellers to obtain Basis-of-Design design capacities.

D. Provide miscellaneous supports/metals required for installation of equipment, piping and ductwork.

3.11 PAINTING

A. Confirm requirements in Division 01 and Division 09. In absence of specific requirements, comply with individual Division 22 sections and the following:
   1. Ferrous Metal: After completion of plumbing work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces, i.e., hangers, hanger rods, equipment stands, with one coat of black enamel for interior suitable for hot surfaces.
   2. In a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
   3. See individual equipment Specifications for other painting.
   4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.

5. Piping: Clean, primer coat and paint exposed piping on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

3.12 ACCESS PANELS

A. Confirm Access Panel requirements in Division 01. In absence of specific requirements in Division 01, comply with individual Division 22 sections and the following:
   1. Coordinate locations/sizes of access panels with Architect prior to work. Label access panels with engraved nameplates indicating function of panel.

3.13 DEMOLITION

A. Confirm Demolition requirements in Division 01 and Division 0. In absence of specific requirements, comply with individual sections in Division 22 and the following:
   1. Scope:
      a. It is the intent of these documents to provide necessary information and adjustments to plumbing system required to meet code, and accommodate installation of new work.
      b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
      c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve underground utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
   2. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
   3. Unless specifically indicated on Drawings, remove exposed, unused piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap piping and patch surfaces to match surrounding finish.
   4. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).

3.14 ACCEPTANCE

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual sections in Division 22 and the following:
   1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
      a. Testing and Balancing Reports
      b. Cleaning
      c. Operation and Maintenance Manuals
      d. Training of Operating Personnel
      e. Record Drawings
      f. Warranty and Guaranty Certificates
      g. Start-up/Test Document and Commissioning Reports

3.15 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 00, Division 01, Section 22 00 00 and individual Division 22 Sections.

B. Tests:
   1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in operation and maintenance manuals.
   2. During site evaluations by Architect or Engineer, provide an electrician with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.16 LETTER OF CONFORMANCE

A. Provide Letter of Conformance and copies of manufacturers' warranties and extended warranties with a statement that fire suppression items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance and copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

B. Warranties to begin at date of substantial completion.

3.17 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize plumbing equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

END OF SECTION 22 00 00

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.01SUMMARY

A. Section Includes:

B. Ball valves.

C. Check valves.

D. Related Sections:

a. Section 220529 - Hangers and Supports for Plumbing Piping and Equipment: Product and installation requirements for pipe hangers and supports.

b. Section 220700 - Plumbing Insulation: Product and installation requirements for insulation for valves.

c. Section 221000 - Plumbing Piping: Product and installation requirements for piping, piping specialties, and equipment used in domestic water, sanitary waste and vent, and storm drainage systems.

1.02 REFERENCES

A. ASTM International:

1. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

B. Manufacturers Standardization Society of the Valve and Fittings Industry:

1. MSS SP 80 - Bronze Gate, Globe, Angle and Check Valves.
2. MSS SP 110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.03 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Section 013300 - Submittal Procedures: Requirements for submittals.

E. Product Data: Submit manufacturers catalog information with valve data and ratings for each service.

F. Manufacturer's Installation Instructions: Submit hanging and support methods, joining procedures.

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

1.04 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves.

B. Operation and Maintenance Data: Submit installation instructions, spare parts lists, exploded assembly views.

1.05 QUALITY ASSURANCE

A. For drinking water service, provide valves complying with NSF 61 “Drinking Water Systems Components - Health Effects”.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section, approved by manufacturer.

1.07 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.08 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.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install valves underground when bedding is wet or frozen.

1.10 WARRANTY

A. Furnish one year manufacturer warranty for valves excluding packing.

1.11 EXTRA MATERIALS

A. Furnish two packing kits for each size valve.

PART 2 - PRODUCTS

2.01 BALL VALVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Conbraco (Apollo)
   2. Milwaukee
   3. Nibco
   4. Or equal.

B. 2 inches and Smaller: MSS SP 110 "Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends", Class 150, bronze, two piece body, chrome plated bronze ball, full port, teflon seats, blow-out proof stem, solder ends (threaded ends at PEX transition adapters), with union, lever handle.

2.02 CHECK VALVES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. Milwaukee.
   2. Nibco

3. Stockham
4. Or equal.

B. Spring Loaded Check Valves (Recirculation Pump Discharge): 2 inches and Smaller: MSS SP 80 "Bronze Gate, Globe, Angle, and Check Valves", Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, solder ends.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Section 013000 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify piping system is ready for valve installation.

3.02 INSTALLATION

A. Install valves with stems upright or horizontal, not inverted.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

C. Install 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

D. Install valves with clearance for installation of insulation and allowing access.

E. Provide access where valves and fittings are not accessible. Coordinate size and location of access doors with Section 083113.

F. Refer to Section 220529 for pipe hangers.

G. Refer to Section 220700 for insulation requirements for valves.

3.03 VALVE APPLICATIONS

A. Install shutoff and drain valves at locations indicated on Drawings in accordance with this Section.

B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

C. Install spring loaded check valves on discharge of water pumps.

D. Install ball valves in domestic water systems for shut-off service.

END OF SECTION 220523

SECTION 220529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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. Section Includes:
   1. Metal pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Fiberglass pipe hangers.

B. Metal framing systems.

C. Fiberglass strut systems.
   a. Thermal hanger-shield inserts.
   b. Fastener systems.
   c. Pipe stands.
   d. Pipe-positioning systems.
   e. Equipment supports.
   f. Related Requirements:
   g. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.03 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Shop Drawings: Signed and sealed by a qualified professional Director’s Representative. Show fabrication and installation details and include calculations for the following:
   1. Trapeze pipe hangers.
   2. Metal framing systems.
   3. Fiberglass strut systems.
   4. Pipe stands.

F. Equipment supports.

G. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional Director’s Representative responsible for their preparation.

H. Detail fabrication and assembly of trapeze hangers.

I. Include design calculations for designing trapeze hangers.

J. Welding certificates.

1.04 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1 “Structural Welding Code – Steel”.

B. Pipe Welding Qualifications: Qualify procedures and operators according to 2015 ASME Boiler and Pressure Vessel Code, Section IX.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional Director’s Representative to design trapeze pipe hangers and equipment supports.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7 and the Oregon Structural Specialty Code.

C. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

D. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

E. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

2.02 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Types 1 through 58, factory-fabricated components.

B. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.

C. Nonmetallic Coatings: Plastic coated or epoxy powder coated.

D. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.

E. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
   1. Copper Pipe and Tube Hangers:
      a. Description: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Types 1 through 58, copper-coated-steel, factory-fabricated components.
      b. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel, for use with copper Type L water tubing.

2.03 TRAPEZE PIPE HANGERS

A. Description: MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”, Type 59, shop- or field-fabricated pipe-support assembly, made from structural-carbon-steel shapes, with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation” carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.04 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. ABB, Electrification Business.
    b. Gregory GSTRUT.
    c. Rocket Rack; Robroy Industries.
    d. Or equal.

B. Description: Shop- or field-fabricated pipe-support assembly, made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.

C. Standard: Comply with MFMA-4, factory-fabricated components for field assembly.

D. Channels: Continuous slotted carbon-steel channel with inturned lips.

E. Channel Width: Selected for applicable load criteria.

F. Channel Nuts: Formed or stamped nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.

G. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

H. Metallic Coating: No coating.

2.05 THERMAL HANGER-SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Buckaroos, Inc.

C. Pipe Shields Inc.

D. Rilco Manufacturing Co., Inc.

E. Or equal.

F. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier, for insulated DCW piping within HVAC plenum return-air assemblies.

G. Insulation-Insert Material for Hot Piping: ASTM C552, Type II cellular glass with 100-psig minimum compressive strength, for insulated DHW and DHW-return piping.

H. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

I. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

J. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.06 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. Hilti, Inc.
        a. MKT Fastening, LLC.
        b. Simpson Strong-Tie Co., Inc.
        c. Or equal.

d. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
e. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1) Cooper B-line; brand of Eaton, Electrical Sector.
    2) Hilti, Inc.
    3) MKT Fastening, LLC.
    4) Or equal.
    5) Indoor Applications: Zinc-coated steel.

2.07 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.08 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.09 MATERIALS

A. Aluminum: ASTM B221 “Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes”.

B. Carbon Steel: ASTM A1011 “Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process”.

C. Structural Steel: ASTM A36 “Standard Specification for Carbon Structural Steel” carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240 “Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications”.

E. Grout: ASTM C1107 “Standard Specification for Packaged Dry, Hydraulic-Cement Grout”, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

F. Properties: Nonstaining, noncorrosive, and nongaseous.

G. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.01 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.02 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”. Install hangers,

supports, clamps, and attachments as required to properly support piping from building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

C. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size, or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.

D. Field fabricate from ASTM A36 “Standard Specification for Carbon Structural Steel” carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1 “Structural Welding Code – Steel”.
   a. Fiberglass Pipe-Hanger Installation: Comply with applicable portions of MSS SP-58 “Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation”. Install hangers and attachments as required to properly support piping from building structure.
   b. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
   c. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.
   d. Fastener System Installation:
      1) Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
      2) Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
      3) Pipe Stand Installation:
      4) Pipe Stand Types, except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
      5) Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.
      6) Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
      7) Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

E. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

F. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

G. Install lateral bracing with pipe hangers and supports to prevent swaying.

H. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, 2-1/2 inch and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
   a. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

b. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 “Building Services Piping” for building services piping.
c. Insulated Piping:
d. Specify parts in first three subparagraphs below as galvanized or painted, as required. Other materials are available in place of wooden blocks.
e. Attach clamps and spacers to piping.
f. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.

END OF SECTION 220529

SECTION 220553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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. Section Includes:
   1. Equipment labels.
   2. Warning signs and labels.
   3. Pipe labels.

B. Stencils.

C. Valve tags.
   a. Warning tags.

1.03 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).Product Data: For each type of product indicated.

D. Samples: For color, letter style, and graphic representation required for each identification material and device.

E. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

F. Valve numbering scheme.

G. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.01 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:
      a. Brady Corporation.
      b. Brimar Industries, Inc.
      c. Carlton Industries, LP.
      d. Champion America.
      e. Craftmark Pipe Markers.
      f. emedco.
      g. Kolbi Pipe Marker Co.
      h. LEM Products Inc.
      i. Marking Services, Inc.
      j. Seton Identification Products; a Brady Corporation company.

k. Panduit Corp.
l. Or equal.

B. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Black.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Plastic Labels for Equipment:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:
a. Brady Corporation.
b. Brimar Industries, Inc.
c. Carlton Industries, LP.
d. Champion America.
e. Craftmark Pipe Markers.
f. emedco.
g. Kolbi Pipe Marker Co.
h. LEM Products Inc.
i. Marking Services, Inc.
j. Seton Identification Products; a Brady Corporation company.
k. Panduit Corp.
l. Or equal.

J. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick and having predrilled holes for attachment hardware.

K. Letter Color: White.

L. Background Color: Black.

M. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

N. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

O. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

P. Fasteners: Stainless-steel rivets.
a. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
b. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

c. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.02 WARNING SIGNS AND LABELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:
   1. Brady Corporation.
   2. Brimar Industries, Inc.
   3. Carlton Industries, LP.
   4. Champion America.
   5. Craftmark Pipe Markers.
   6. emedco.
   7. LEM Products Inc.
   8. Marking Services Inc.
   9. National Marker Company.
   10. Seton Identification Products; a Brady Corporation company.
   11. Stranco, Inc.
   12. Panduit Corp.
   13. Or equal.

B. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick and having predrilled holes for attachment hardware.

C. Letter Color: White.

D. Background Color: Black.

E. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

F. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

G. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

H. Fasteners: Stainless-steel rivets.

I. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

J. Label Content: Include caution and warning information plus emergency notification instructions.

2.03 PIPE LABELS

A. Do not use pipe labels or plastic tapes for bare pipes conveying fluids at temperatures of 125 deg F (52 deg C) or higher.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:
   1. Actioncraft Products, Inc.; a division of Industrial Test Equipment Co., Inc.
   2. Brady Corporation.
   3. Brimar Industries, Inc.
   4. Carlton Industries, LP.
   5. Champion America.

6. Craftmark Pipe Markers.
7. emedco.
    a. Kolbi Pipe Marker Co.
8. LEM Products Inc.
9. Marking Services Inc.
10. Seton Identification Products; a Brady Corporation company.
11. Panduit Corp
12. Or equal.

C. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

D. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

E. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

F. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

G. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.

H. Lettering Size: Size letters according to ASME A13.1 for piping.

2.04 STENCILS

A. Stencils for Piping: Provide stencils for the following piping systems: Domestic Cold Water (DCW), Domestic Hot Water (DHW), Domestic Hot Water Return (DHWR), Sanitary Waste and Vent, and Condensate Drain.
    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
        a. Brimar Industries, Inc.
        b. Craftmark Pipe Markers.
        c. Kolbi Pipe Marker Co.
        d. Marking Services Inc
        e. Or equal.

B. Lettering Size: Size letters according to ASME A13.1 for piping.

C. Stencil Material: Aluminum.

D. Stencil Paint: Exterior, gloss, alkyd enamel in colors complying with recommendations in ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

E. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated. Paint may be in pressurized spray-can form.

2.05 VALVE TAGS

A. Valve Tags to be round in shape.

B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

C. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.

D. Fasteners: Brass wire-link chain.

E. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

F. Valve-tag schedule shall be included in operation and maintenance data.

2.06 WARNING TAGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equal:
   1. Brady Corporation.
   2. Brimar Industries, Inc.
   3. Champion America.
   4. Craftmark Pipe Markers.
   5. emedco.
   6. Kolbi Pipe Marker Co.
   7. LEM Products Inc.
   8. Marking Services Inc.
   9. Seton Identification Products; a Brady Corporation company.
   10. Panduit Corp.
   11. Or equal.

B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.

C. Size: 3 by 5-1/4 inches minimum.

D. Fasteners: Brass grommet and wire.

E. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."

F. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
   1. Coordinate installation of identifying devices with locations of access panels and doors.

B. Install identifying devices before installing acoustical ceilings and similar concealment.

C. Install the Work of this Section in accordance with the manufacturer’s printer installation instructions, unless otherwise specified.

3.03 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.04 PIPE LABEL INSTALLATION

A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels, complying with ASME A13.1, with painted, color-coded bands or rectangles on each piping system.

B. Identification Paint: Use for contrasting background.

C. Stencil Paint: Use for pipe marking.

D. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

E. Near each valve and control device.

F. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

G. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

H. At access doors, manholes, and similar access points that permit view of concealed piping.

I. Near major equipment items and other points of origination and termination.

J. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

K. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

L. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

M. Pipe Label Color Schedule:

N. Domestic Water Piping (DCW, DHW, and DHW Return):
   1. Background: Safety green.

O. Letter Colors: White.

P. Sanitary Waste and Vent Piping:
   1. Background Color: Black.

Q. Letter Color: White.

R. Condensate Drain Piping:

S. Background: Yellow.

T. Letter Colors: White.

3.05 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
   1. Other valve-tag sizes and shapes may be available if required.

C. Valve-Tag Size and Shape:

D. Cold Water: 1-1/2 inches, round.

E. Hot Water: 1-1/2 inches, round.

F. Valve-Tag Colors:
   a. Cold Water: Natural.

2. Hot Water: Natural.

G. Letter Colors:
1. Cold Water: White.
2. Hot Water: White.

3.06 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220700
PLUMBING INSULATION

PART 1 - GENERAL

1.01SUMMARY

A. Section Includes:
   1. Plumbing piping insulation, jackets and accessories.
   2. Plumbing equipment insulation, jackets and accessories.

B. Related Sections:
   1. Section 078413 - Penetration Firestopping: Product requirements for firestopping for placement by this section.
   2. Section 099114 and/or 099123 - Painting and Coating: Execution requirements for painting insulation jackets and covering specified by this section.

1.02 REFERENCES

A. ASTM International:
   1. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   3. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
   5. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
   6. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
   7. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
   8. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
   9. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
   10. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
   11. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
   12. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
   13. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
   14. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
   15. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
   16. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
   17. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
   18. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120.
   19. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   20. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

1.03 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer’s installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Section 013300 - Submittal Procedures: Submittal procedures.

E. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.

F. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.

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

1.04 QUALITY ASSURANCE

A. Use smoke developed index of 50 within plenums.

B. Verify flame spread index and smoke developed index with types of insulation specified in body of section. Some insulation types included in this section are not allowed to be used in plenums.

C. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 450 in accordance with ASTM E84 “Standard Test Method for Surface Burning Characteristics of Building Materials”.

D. Pipe insulation manufactured in accordance with ASTM C585 “Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System)” for inner and outer diameters.

E. Factory fabricated fitting covers manufactured in accordance with ASTM C450 “Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging”.

F. Maintain one copy of each document on site.

1.05 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing Work of this section, approved by manufacturer.

1.06 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

1.09 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Furnish five year manufacturer warranty for man-made fiber.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Glass Fiber and Mineral Fiber Insulation

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. CertainTeed Corporation
   2. Knauf Fiberglass GmbH
   3. Manville
   4. Owens-Corning Fiberglass Corporation
   5. USG Interiors, Inc. – Thermafiber Division
   6. Or equal.

2.02 PIPE INSULATION

A. TYPE P-1: ASTM C547 "Standard Specification for Mineral Fiber Pipe Insulation", molded glass fiber pipe insulation. Used for domestic hot water (DHW), DHW return, and domestic cold water (DCW) piping insulation on this Project.

B. Insulation Thickness: 1 inch, all pipe sizes.

C. Thermal Conductivity: 0.22 to 0.28 at 75 degrees F.

D. Operating Temperature Range: 35 to 140 degrees F.
   1. Vapor Barrier Jacket: ASTM C1136 "Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation", factory applied reinforced foil kraft with self-sealing adhesive joints. Required only for DCW piping located within an HVAC plenum return-air assembly; not required for DHW or DHW-return piping.

E. Jacket Temperature Limit: minus 20 to 150 degrees F. No field- or factory-applied jacket is required for insulated piping on this Project; provide vapor barrier jacket only where noted above.

2.03 PIPE INSULATION ACCESSORIES

A. Vapor Retarder Lap Adhesive: Compatible with insulation.
   a. Covering Adhesive Mastic: Compatible with insulation.
   b. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69 “Pipe Hangers and Supports”, Type 40. Length: Based on pipe size and insulation thickness.
   c. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.

1) Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

B. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449 “Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement”.

C. Insulating Cement: ASTM C195 “Standard Specification for Mineral Fiber Thermal Insulating Cement”; hydraulic setting on mineral wool.
   a. Adhesives: Compatible with insulation.

END OF SECTION 22 07 00

SECTION 22 10 00
PLUMBING PIPING

PART 1 - GENERAL

1.01SUMMARY

A. Work included: Provision of materials, installation and testing of:
   1. Sanitary, DWV Piping, Buried Within 5-feet of Building
   2. Sanitary DWV Piping, Above Grade
   3. Water Piping, Buried Within 5-feet of Building
   4. Hot and Cold Water Above Grade
   5. Condensate Piping
   6. Primer Piping
   7. Flanges, Unions, and Couplings
   8. ABS (Acrylonitrile-Butadiene-Styrene) Pipe and Fittings
      a. Wall and Floor Sleeves

1.02 RELATED SECTIONS

A. Contents of Division 22 and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 22 00 00 and Division 01, General Requirements.

B. In addition, meet the following:

C. NSF 61 Appendix 'G' - Low Lead Products Used in Drinking Water Systems (less than or equal to 25 percent lead).

1.04 SUBMITTALS

A. Submittals as required by Section 22 00 00 and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 22 00 00 and Division 01, General Requirements.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 22 00 00 and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Uponor

B. Cerro

C. Tyler

D. Charlotte

E. Nibco

F. Orion

G. or approved equivalent.

2.02 GENERAL

A. Provide pipe, tube and fittings of the same type, fitting requirements, grade, class and the size and weight indicated or required for each service, as indicated in other Division 22 Specifications. Where type, grade, or class is not indicated, provide proper selection as determined by installer for installation requirements, and comply with governing regulations and industry standards.

B. Manufactured materials delivered, new to the project site and stored in their original containers.

C. Product Marking: Each item to be furnished with legible markings indicating: name brand and manufacturer, manufacturing process, heat number and markings as required per ASTM and UL/FM Standards.

D. Applicable Standards:
   1. Copper piping to conform to ASTM B88, B306 and B208 and the standards of Copper development Association (CDA), and American Welding Society, (AWS).
   2. Cast Iron Piping to conform to standards of ASTM A-74 and CISPI HS-74, CISPI 301 and FM 1680.
   3. Manufacturer's Standards Society (MSS) for valving and support reference standard.
   4. American Waters Association (AWWA) for Valving Assembly Standards.
   5. American Society of Sanitation Engineers (ASSE) for Valving Standards.
   6. American National Standards Institute (ANSI) for Piping Standards.
   7. NFPA Standard 51B - “Fire Prevention in Use of Cutting and Welding Processes”.
   8. Crosslinked polyethylene (PEX) pipe conforming to ASTM F876, F877 and CSA B1375, or DIN 16892 and 16893.

2.03 SANITARY DWV PIPING, BURIED WITHIN 5-FEET OF BUILDING

A. ABS Pipe: ASTM D275 schedule 40 single extrusion or ASTM F628 Schedule 40, co extruded.

B. Fittings: ABS DWV ASTM D2661.

C. Joints: Solvent welded with ASTM D2235 cement.

2.04 SANITARY DWV PIPING, ABOVE GRADE

A. Schedule 40 PVC Pipe: ASTM D2665, per 2021 UPC 705.5.2.

B. Fittings: PVC DWV, ASTM D2665.

C. Joints: Solvent welded, ASTM D2564.

D. Where DWV piping is routed within an HVAC return-air plenum, provide hubless cast iron pipe (ASTM A888 or CISPI 301) with stainless steel shielded no-hub couplings in lieu of PVC.

2.05 WATER PIPING, BURIED WITHIN 5-FEET OF BUILDING

A. Copper Pipe: ASTM B88, hard drawn, Type K (A).

B. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.

C. Joints: Brazed - BCuP2.

2.06 HOT AND COLD WATER ABOVE GRADE

A. Copper Tube, piping over 1-1/2 inches: ASTM B88, Type L, drawn.

B. Fittings: ASME B16.18 cast copper alloy, or ProPress copper press fittings.

C. Joints: ASTM B32 lead-free solder, or ProPress mechanical press joints.

D. Tubing, piping 1-1/2 inches and under: Cross-linked polyethylene (PEX), ASTM F876 and F877.

E. Fittings: PEX engineered plastic or brass fittings per tubing manufacturer, NSF 61 / UPC 604.1 compliant.
   a. Joints: Per PEX tubing manufacturer's crimp, clamp, or expansion fitting system.
   b. Domestic cold and hot water piping (including recirculation) routed within an HVAC return-air plenum shall meet the pipe/tubing manufacturer's flame-spread and smoke-developed rating requirements for plenum installation.

2.07 CONDENSATE PIPING

A. Pipe: Schedule 40 PVC, ASTM D1785.

B. Fittings: PVC DWV, ASTM D2665.

C. Joints: Solvent welded, ASTM D2564.

2.08 PRIMER PIPING

A. Above Ground: Type L hard-drawn copper tubing with wrought sweat fittings and soldered joints, connected to electronically-operated trap primer valves at each primer connection.

B. Below gound: Type L soft annealed copper tubing with wrought sweat fittings and brazed joints.

C. Below gound: Cross-linked polyethylene (PEX) and engineered plastic fittings.

2.09 FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3-inches and Under:

B. Ferrous Pipe: Class 150 malleable iron threaded unions.

C. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

D. Flanges for Pipe Size Over 1-Inch:

E. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

F. Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

G. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.10 ABS (ACRYLONITRILE - BUTADIENE - STYRENE) PIPE AND FITTINGS

A. Pipe and Pipe Fitting: Schedule 40 DWV, ASTM D2661-IAMPMO IS5-92. No foam core piping permitted.

B. Joints: Solvent weld, NSF 14-90, ASTM D2235-93A, ASTM F402-93.

2.11 WALL AND FLOOR SLEEVES

A. Below Grade and High Water Table Areas:
   1. “Link-Seal" Pipe Sleeves: Neoprene gasket links bolted together around an interior sleeve forming a watertight seal. Provide Type C unless otherwise noted. OS with S-316 stainless construction for continuous water/tank walls. Thunderline Corporation or approved equivalent.

B. Sleeves under or through concrete foundations: Ductile iron pipe. Class 50 or 51 pipe conforming to ANSI/AWWA C151/A21.51, cement lined. Pipe sleeve will extend a minimum of 6-inches beyond outside perimeter of foundation. Final placement of sleeve will be confirmed

with project's structural engineer. In areas with a high water table, provide AWWA C900, Class 235 plastic pipe in lieu of ductile iron pipe.

C. Pre-Engineered Firestop Pipe Penetration Systems: UL listed assemblies for maintaining fire rating of piping penetrations through fire-rated assemblies. Comply with ASTM E814.

D. Insulating Caulking: Eagle or Pitcher Super 66 high temperature cement.

E. Fabricated Accessories:

F. Steel Pipe Sleeves: Fabricate from Schedule 40 black or galvanized steel pipe. Remove end burrs by grinding.

G. Sheet Metal Pipe Sleeves: Fabricate from G-90 galvanized sheets closed with lock-seam joints. Provide following minimum gauges for sizes indicated:
   1. Sleeve Size 4-inches in Diameter and Smaller: 18 gauge.

H. Sleeve Sizes 5-inches to 6-inches: 16 gauge.

I. Sleeve Sizes 7-inches and Larger: 14 gauge.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.02 INSTALLATION

A. Work performed by experienced journeyman plumbers.

B. Provide access panels for concealed valves, shock arrestors and trap primers.

C. Install pipes and pipe fittings in accordance with recognized industry practices.

D. Align piping accurately at connections, within 3/32-inch misalignment tolerance. Comply with ANSI B31 Code for Pressure Piping.

E. Locate piping runs, as indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details, and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, and other structural and permanent-enclosure elements of building. Limit clearance to 1/2-inch where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1-inch clearance outside insulation. Whenever possible in finished and occupied spaces, conceal piping from view by locating it in column enclosures, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as indicated.

F. Do not run piping through transformer vaults, telephone, elevator, electrical or electronic equipment spaces or enclosures.

G. Concealed Piping Above Suspended Ceiling: Plan and coordinate to avoid interferences; install to maintain suspended ceiling heights shown on Architectural Drawings. Allow sufficient space above removable ceiling panels for panel removal. Locate piping so that valves are visible and accessible within 61cm horizontally and vertically from point of access to the ceiling space.

H. Exposed Work: Run pipes parallel to the closest wall unless otherwise shown on Drawings; maintain maximum headroom; avoid light fixtures.

I. Insulation Space Allowance: In piping work, allow space for pipe insulation and jackets. If interferences occur, move the piping to accommodate insulation thickness specified.

J. Pipe Lengths: Do not use short lengths or nipples at locations where a full length of pipe will fit.

K. Alignment Prior to Supporting and Anchoring: Place piping in proper alignment and position prior to connection to anchors, expansion loops, and equipment. Furnish jacking devices, temporary steel structural members, and assembled structures as necessary. Remove temporary equipment and structures supplied by contractor at completion; such items to remain Contractor property.

L. Valve and Equipment Connections: Piping not to place undue stress on flanged valves and equipment connections. Mating flange faces to be true and parallel to each other and not to require springing of piping for assembly. Pipe hangers and supports to carry the full weight of the pipe and fluid.

M. Piping Leaks: Correct immediately; use new materials; leak-sealing compounds or peening not permitted.

N. Pressure Ratings of Fittings, Valves, and Devices in Piping Systems: Pressure rating to be equal to or greater than the maximum working pressure of the system.

O. Equipment Vents and Drains: Provide for coils and vessels which contain water. Provide isolation valves and outlet valves at piping high and low points to permit venting and draining of the vessel without venting and draining connected piping. Provide hose connections and caps on drain lines.

P. Escutcheon Plates: Where exposed insulated and uninsulated piping passes through walls, floors or ceilings; provide spring clip type. Provide plates on both sides of wall or floor.

3.03 PIPE JOINTS

A. Piping to be cut squarely, free of rough edges and reamed to full bore. Piping to be fully inserted into fittings.

B. Provide joints of type indicated in each piping system.

C. Thread pipe in accordance with ANSI B2.1. Cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Remove excess cutting oil from piping prior to assembly. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.

D. Solder copper tube and fitting joints with lead free nickel/silver bearing solder meeting ASTM std. B-32, in accordance with IAPMO Is 3-93, ASTM B-828 and Copper Development Association recommended procedures. Joints to be cleaned by other than chemical means prior to assembly. "Shock" cooling is prohibited. Fluxes to be water soluble for copper and brass potable water applications, and meets CDA standard test method 1.0 and ASTM B813-91. Solder to be applied until a full fillet is present around the joint. Solder and flux not to be applied in such excessive quantities as to run down interior of pipe. Lead solder or corrosion flux not to be present at the jobsite.

E. Braze copper tube and fitting socket with BCUP series filler metal without flux. Listed brazing flux to be used for joining of copper tube to brass or bronze fittings and will meet AWS FB3A or FB3C. "Shock" cooling is prohibited. a continuous fillet is to be visible around the completed joint. After cooling, flux residue to be thoroughly removed with warm water and a brush prior to testing. Do not use BCUP filler on copper alloys containing over 10 percent nickel. Piping is to be capped or plugged during construction to prevent entry of foreign material.

F. Welders performing work under this Contract to be certified and qualified in accordance with tests prescribed by the National Certified Welding Bureau (NCWB) or by other approved test procedures using methodology and procedures covered in the ASME Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators". Installation to conform to ANSI 31.1 "Power Piping".

G. Submit for approval the names, identification, and welder's assigned number, letter or symbol for welders assigned to this project.

H. The assigned identification symbol to be used to identify the work of each welder and to be indelibly stamped immediately upon completion of each weld.

I. Welders to be tested and certified for all positions.

J. Submit identifying stenciled test coupons made by each operator.

K. Welders may be required to retake welding certification tests without additional expense.

L. When so requested, a welder will not be permitted to work as a welder on this project until he has been recertified in accordance with NCWB.

M. Recertification of the welder to be made after the welder has taken and passed the required tests.

N. Flanges:

O. Provide flanges at steel or copper piping, valves and equipment, sizes 2-1/2-inches or larger, unless specified otherwise; weld neck or slip-on pattern.

P. Bolts: Provide studs (both ends threaded) with hexagon nuts where necessary to facilitate removal of valves or disassembly of flanged systems.

Q. Dielectric Flanged Insulation: Provide on dissimilar metal flanged piping connections.

3.04 SANITARY SEWER

A. Piping to be graded at a uniform pitch of 1 percent per foot on building main and 2 percent per foot on branch lines unless otherwise noted on Drawings.

B. Indirect Waste or Drain Piping: Extend piping to discharge as shown on Drawings. Maintain minimum air gap. Provide traps on direct waste or drain piping exceeding 60-inches.

C. Fixture Carriers: Concealed fixture carriers for wall hung plumbing fixtures are specified in Section 22 40 00.

D. Drains:

   a. Install drains to suit finished floor or roof surface. Install drains and components per manufacturer's instructions. Arrange for flooring to be sloped to floor drain or sink a minimum of 13mm below finished floor elevation.

   b. Install P-traps for hub drains, floor drains and floor sinks P-traps to be of the same materials as soil and waste piping. Provide trap primer assembly for each drain or floor sink.

   c. Wall Access Panel: Secure to wall framing and install so that flange forms a close fitting joint with the finished wall surface.

   d. Heat trace and insulate P-traps exposed to freezing conditions.

   e. Insulate horizontal interior rainwater drain and storm drain lines.

   f. Insulate horizontal branch lines from floor sinks, recepters and drains receiving cold discharge from equipment and appliances.

3.05 DOMESTIC WATER

A. "Piping" to include pipes, fittings, nipples, valves and accessories connected thereto.

B. Run piping generally parallel to the axis of the building, arranged to conform to the building requirements and to suit the necessities of clearance for other mechanical ducts, flues, conduits and work of other trades, and as close to ceiling or other construction as practical, free of unnecessary traps or bends.

C. Grade water supply piping for complete drainage of the system. Install hose bibbs at low points.

D. Piping connections to equipment to be made up with unions.

E. Provide sufficient elbows, swings and offsets to permit free expansion and contraction.

F. Use reducers or increasers. Use no bushings.

G. Ream or file each pipe to remove burrs. Inspect each length of pipe and each fitting for workmanship and clear passageways.

H. Cover, cap or otherwise protect open ends of piping during construction to prevent damage to threads or flanges and prevent entry of foreign matter. Disinfect and sterilize water supply piping as specified. Furnish written report on final water quality results.

I. Exposed connections to equipment to be installed with special care, showing no tool marks or threads at fittings and piping. No bowed or bent piping to be permitted.
   1. Ferrous to non-ferrous connections to be made by means of dielectric fittings.
      a. Use extra heavy pipe for nipples, where unthreaded portion is less than 1-1/2-inches. Use no close nipples. Use only shoulder-type nipples.
   2. Through-Wall Pipes: Type 'L' copper tubing for through-wall pipes which connect to exposed stops at wall surface. Anchor the pipes in the wall; attach pipe with U-bolts to steel back-up plates or steel angles anchored in the wall. Provide wrought copper elbow which securely anchors ears in wall at through-wall pipes.
   3. Provide drain valves at base of risers and at low points on the system.
   4. Backflow Preventers: Pipe relief to nearest drain. Slope at 2 percent per foot.

3.06 SLEEVES

A. Pipe Sleeves:
   1. Layout work in advance of pouring concrete, furnish, and set sleeves necessary to complete work.
   2. Floor Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Extend sleeve 1-inch above finished floor. Caulk pipes passing through floor with non-shrinking grout or approved caulking compound (Except DWV Piping penetrating a concrete Slab set on Finish Grade), provide "Link-Seal" sleeve sealing system for concrete/slab penetrations which are below grade. Caulk/seal piping passing through fire rated building assembly with UL rated assemblies. Provide fire-rated assemblies per local AHJ requirements
   3. Wall Sleeves: Provide sleeves on pipes passing through concrete or masonry construction. Provide sleeve flush with finished face of wall. Caulk pipes passing through walls with non-shrinking caulking compound. Provide "Link-Seal" sleeve sealing system for concrete penetrations which are below grade. Caulk/seal piping passing through fire-rated assemblies per local AHJ requirements.
   4. Beam Sleeves: Coordinate with trades for locations of pipe sleeves in reinforced concrete and steel beams. Indicate penetrations on structural shop drawings. See Drawings and Specifications for specific sleeve location limitations. Plumbing Drawings are diagrammatic. Offset piping as required to meet these limitations. Pipe sleeve locations must be indicated on reinforced concrete and steel beam shop drawings. Field cutting of beams not allowed without written approval of structural engineer. No extra costs allowed for failure to coordinate beam penetrations prior to reinforced concrete and steel beam shop drawing submittal.
   5. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:

B. Install fabricated pipe sleeve.

C. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve I.D.

D. Seal each end airtight with a resilient nonhardening seal per code.

E. Piping penetrations through fire-rated (1 to 3 hour) assemblies:
   1. Select and install pre-engineered pipe penetration system in accordance with UL listing and manufacturer's recommendation.

F. Reference Division 7.

G. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E84.

3.07 EXCAVATION AND BACKFILL

A. Trenching, bedding and backfill to meet the requirements of the Project Geotechnical Report. The standards listed below are a minimum.

B. Native soils may not be used for bedding or pipe zone backfill without specific approval of the Project Geotechnical Consultant.

C. General: Perform necessary excavation and backfill required for installation of plumbing work. Repair piping or other work at no expense to Owner.

D. Water: Keep excavations free of standing water. Reexcavate and fill back excavations damaged or softened by water or frost to original level with sand, crushed rock or other approved material at no expense to Owner.

E. Tests: During progress of work for compacted fill, Owner reserves right to request compaction tests made under direction of testing laboratory.

F. Trench Excavation: Excavate trenches to necessary depth and width, removing rocks, unstable soil (muck, peat), roots and stumps. Excavation material is classified as "base fill" and "native." Base fill excavation material consisting of placed crushed rock may be used as backfill above "Pipe Zone." Remove and dispose off site native excavation material. Adequate width of trench for proper installation of piping or conduit.

G. Support Foundations:
   1. Foundations: Excavate trenches located in unstable ground areas below elevation required for installation of piping to depth which is determined by Architect as appropriate for conditions encountered. Place and compact approved foundation material in excavation up to "Bedding Zone." Dewatering, placement, compaction and disposal of excavated materials to conform to requirements contained in other sections of Specifications or Drawings.
   2. Over-Excavations: Where trench excavation exceeds required depths, provide, place and compact suitable bedding material to proper grade or elevation at no additional cost to Owner.
   3. Foundation Material: Where native material has been removed, place and compact necessary foundation material to form base for replacement of required thickness of bedding material.

H. Bedding Material: Full bed piping on sand, pea gravel, or 3/4-inch minus crushed rock. Place minimum 4-inch deep layer of sand, pea gravel, or crushed rock on leveled trench bottom for this purpose. Remove bedding to necessary depth for piping bells and couplings to maintain contact of pipe on bedding for its entire length. Provide additional bedding in excessively wet, unstable, or solid rock trench bottom conditions as required to provide firm foundation.

I. Backfilling:
   1. Following installation and successful completion of required tests, backfill piping in lifts.

J. In "Pipe Zone" place backfill material and compact in lifts not to exceed 6-inches in depth to height of 12-inches above top of pipe. Place backfill material to obtain contact with entire periphery of pipe, without disturbing or displacing pipe.

K. Place and compact backfill above "Pipe Zone" in layers not to exceed 12-inches in depth.

L. Backfill Material:

M. Backfill Material in "Pipe Zone": 3/4-inch minus crushed rock, sand or pea gravel.
   1. Crushed rock, fill sand or other backfill material approved elsewhere in Specifications may be used above "Pipe Zone."
   2. Compaction of Trench Backfill:

a. Where compaction of trench backfill material is required, use one of following methods or combination thereof:

N. Mechanical tamper,

O. Vibratory compactor, or

P. Other approved methods appropriate to conditions encountered.

Q. Architect to have right to change methods and limits to better accommodate field conditions. Compaction sufficient to attain 95 percent of maximum density at optimum moisture content unless noted otherwise on Drawings or elsewhere in Specifications. Water "puddling" or "washing" is prohibited.

3.08 TESTING

A. General:

B. Provide temporary equipment for testing, including pumps, compressors, tanks, and gauges, as required. Test piping systems before insulation (if any) is installed and remove or disengage control devices before testing. Where necessary, test sections of each piping system independently, but do not use piping valves to isolate sections where test pressures exceed local valve operating pressure rating. Fill each section with water, compressed air, or nitrogen and pressurize for the indicated pressure and time.

C. Notify Architect and local Plumbing Inspector 2 days before tests.

D. Drainage, Waste and Vent Piping: Test in accordance with governing plumbing code or as follows: Test drainage and venting systems, with necessary openings plugged, to permit system to be filled with water and subjected to water pressure of minimum of 5 PSI head. System to hold water without water level drop greater than 1/2 pipe diameter of largest nominal pipe size within 24-hour period. Test system in sections if minimum head cannot be maintained in each section. 5 PSI head to be minimum pressure at highest joint.

E. Water Piping: Eliminate air from system. Fill and test at 125 PSIG or minimum 1-1/2 times static pressure at connection to serving utility main for period of two hours with no loss in pressure.

F. Send test results to Architect for review and approval.

G. Testing of Pressurized Systems:
   1. Test each pressurized piping system at 150 percent of operating pressure indicated, but not less than 125 PSIG test pressure.
   2. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 2 percent of test pressure.
   3. Test hot and cold domestic water piping systems upon completion of rough-in and before connection to fixtures at hydrostatic pressure of 125 PSIG.

3.09 STERILIZATION OF DOMESTIC WATER SYSTEM

A. General: Upon completion of tests and necessary replacements, thoroughly flush and disinfect domestic water piping.

B. Method: After thoroughly flushing system with water to remove sediment, fill system with a solution containing 50 parts per million of chlorine for not less than 24 hours or 200 parts per million of chlorine for not less than 3 hours. After retention, drain, reflush and return system to service.

C. Certification: Provide copy of domestic water chlorination certificate in each operations and maintenance manual.

3.10 PROTECTION

A. Keep pipe openings closed by means of plugs or caps to prevent entrance of foreign matter. Protect piping, ductwork, fixtures, equipment and apparatus against dirty water, chemical or mechanical damage both before and after installation. Restore to its original condition or replace fixtures, equipment or apparatus damaged prior to final acceptance of work.

3.11 FIRESTOPPING PENETRATIONS IN FIRE-RATED WALL/FLOOR ASSEMBLIES

A. Reference Division 7.

B. Provide proper sizing when providing sleeves or core-drilled holes to accommodate penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet requirements of ASTM E814.

C. Manufacturers: Hilti and Proset.

END OF SECTION 22 10 00

SECTION 223300
ELECTRIC, DOMESTIC-WATER HEATERS

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. Section Includes:
   1. Commercial, light-duty, storage, electric, domestic-water heaters.

1.03 SUBMITTALS

A. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

B. Manufacturer's installation instructions shall be provided along with product data.

C. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

D. Product Data: For each type of product.

E. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

F. Shop Drawings:
   1. Include diagrams for power, signal, and control wiring.

G. Coordination Drawings: Equipment room drawing or BIM model, drawn to scale, on which the items described in this Section are shown and coordinated with all building trades.

H. Seismic Qualification Data: Certificates, for commercial domestic-water heaters, accessories, and components, from manufacturer.

I. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

J. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

K. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

L. Product Certificates: For each type of commercial, electric, domestic-water heater.

M. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

N. Source quality-control reports.

O. Field quality-control reports.

P. Sample Warranty: For special warranty.

1.04 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric, domestic-water heaters to include emergency, operation, and maintenance manuals.

1.05 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.06 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

B. Failures include, but are not limited to, the following:
   1. Structural failures including storage tank and supports.
   2. Faulty operation of controls.
   3. Deterioration of metals, metal finishes, and other materials beyond normal use.
   4. Warranty Periods: From date of Substantial Completion.
   5. Commercial, Electric, Storage, Domestic-Water Heaters:

C. Storage Tank: Five years.

D. Controls and Other Components: Three years.

E. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:
   1. Storage Tank: Three years.
   2. Controls and Other Components: Two years.

F. Expansion Tanks: Five years.

PART 2 - PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. Seismic Performance: Commercial, electric, domestic-water heaters shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

C. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

D. For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

E. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

F. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

G. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

2.02 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

A. Commercial, Light-Duty, Storage, Electric, Domestic-Water Heaters:
   1. Manufacturer: Bradford White Corporation (basis of design), or equal, as approved by Owner.
   2. Source Limitations: Obtain domestic-water heaters from single source from single manufacturer.

3. Commercial, light-duty, storage, electric, domestic-water heaters are limited to 120-gal. (454-L) capacity. These commercial domestic-water heaters are covered by UL 174 for residential domestic-water heaters.
4. Standard: UL 174.
5. Storage-Tank Construction: Steel, vertical arrangement.
6. Tappings: ASME B1.20.1 pipe thread.
7. Pressure Rating: 150 psig (1035 kPa).
8. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.
9. Factory-Installed, Storage-Tank Appurtenances:
10. Anode Rod: Replaceable magnesium.
11. Dip Tube: Required unless cold-water inlet is near bottom of tank.
12. Drain Valve: Corrosion-resistant metal with hose-end connection.
13. Insulation: Comply with ASHRAE/IES 90.1.
14. Jacket: Steel with enameled finish or high-impact composite material.
15. Heat-Trap Fittings: Inlet type in cold-water inlet and outlet type in hot-water outlet.
16. Heating Elements: Electric, screw-in immersion type.
17. Temperature Control: Adjustable thermostat.
18. Safety Control: High-temperature-limit cutoff device or system.
19. Relief Valve: ASME rated and stamped for combination temperature-and-pressure relief valves. Include relieving capacity at least as great as heat input, andinput and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valve with sensing element that extends into storage tank.
20. Special Requirements: NSF 5 construction with legs for off-floor installation.
21. Capacity and Characteristics: Refer to drawings.

END OF SECTION 22 33 00

SECTION 224000
PLUMBING FIXTURES

PART 1 - GENERAL

1.01SUMMARY

A. Section Includes:
   1. Tank-type water closets.
   2. Lavatories.
   3. Sinks.
   4. Showers.
   5. Drinking fountains and bottle fillers.

B. Related Sections:
   1. Section 079200 - Joint Sealants: Product requirements for calking between fixtures and building components for placement by this Section.

C. Section 221000 - Plumbing Piping: Supply and waste connections to plumbing fixtures.

D. Section 260000 - Electrical: Execution requirements for electric connections to sensor valves and faucets.

1.02 REFERENCES

A. American National Standards Institute:
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ANSI Z124.2 - Plastic Shower Units.

B. Air-Conditioning and Refrigeration Institute:
   1. ARI 1010 - Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
   2. American Society of Mechanical Engineers:

C. ASME A112.6.1 - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use.

D. ASME A112.18.1 - Plumbing Fixture Fittings.

E. ASME A112.19.2M - Vitreous China Plumbing Fixtures.

F. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals.

1.03 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

C. Samples: Submit two fixtures for color matching, where required by Architect.

D. Manufacturer's Installation Instructions: Submit installation methods and procedures.

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

F. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.

G. Manufacturer’s installation instructions shall be provided along with product data.

H. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

1.04 CLOSEOUT SUBMITTALS

A. Section 017716 Contract Closeout:
   1. Article 1.5 Operation and Maintenance Data:

a. Submit fixture, trim, exploded view, and replacement parts lists.

1.05 QUALITY ASSURANCE

A. Provide products requiring electrical connections listed and classified by UL as suitable for purpose specified and indicated.

B. Provide plumbing fixture fittings according to ASME A112.18.1 “Plumbing Fixture Fittings” that prevent backflow from fixture into water distribution system.
   a. Maintain one copy of each document on Site.

1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience, and with service facilities within 100 miles of Project.

B. Installer: Company specializing in performing Work of this Section with minimum three years documented experience and approved by manufacturer.

1.07 PRE-INSTALLATION MEETINGS

A. Section 013000 - Administrative Requirements: Pre-installation meeting.

B. Convene minimum one week prior to commencing Work of this Section.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 016500 – Materials and Equipment:

B. Product storage and handling requirements.

C. Accept fixtures on Site in factory packaging. Inspect for damage.

D. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.09 WARRANTY

A. Section 017000 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish one-year manufacturer warranty for plumbing fixtures.

1.10 EXTRA MATERIALS

A. Section 017000 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish two of the following extra materials for each fixture type furnished: flush valve service kits, faucet washers, showerheads, and toilet seats.

PART 2 - PRODUCTS

2.01 TANK-TYPE WATER CLOSETS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. American Standard, Inc.
   2. Kohler Co.
   3. Approved Equivalent.

B. Bowl: ASME A112.19.2 "Vitreous China Plumbing Fixtures"; floor mounted, siphon jet, elongated, vitreous china, close-coupled two-piece closet combination, comfort/ADA height, gravity-fed, maximum 1.28 gal. flush volume. Basis of Design: Kohler K-3999-RA (Wellworth), or equal approved by Owner.

C. Tank Trim: ASME A112.19.5 "Trim for Water-Closet Bowls, Tanks and Urinals"; vitreous china insulated flush tank with concealed cover, trip-lever handle, fill valve, and flush valve. Basis of Design: Kohler K-3999-RA, or equal approved by Owner.

D. Seat: Solid white plastic, elongated, open front, extended back, self-sustaining check hinge, without cover. Basis of Design: Kohler K-4666-C, or equal approved by Owner.

E. Provide elastomeric gasket complying with ASME A112.4.3 "Plastic Fittings for Connecting Water Closets to the Sanitary Drainage System", or approved setting compound, for fixture-to-floor-flange connection.

2.02 LAVATORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. American Standard, Inc.
   2. Kohler Co.
   3. Approved Equivalent.

B. Vitreous China Wall Hung Basin (Fixture L-1): ASME A112.19.2 "Vitreous China Plumbing Fixtures"; vitreous china wall hung lavatory, with 4-inch high back, drillings on 4-inch centers, rectangular basin with splash lip, front overflow, and soap depression. Basis of Design: American Standard Lucerne 0356015.020, or equal approved by Owner.

C. Supply Fitting (Fixture L-1): ASME A112.18.1 "Plumbing Fixture Fittings"; chrome-plated single-lever supply fitting with 0.5 gpm water economy aerator, temperature-limited to 110 degrees F. Basis of Design: American Standard Colony 7075.054, or equal approved by Owner.

D. Waste Fittings: ASME A112.18.2 "Plumbing Waste Fittings" or ASTM F409 "Standard Specification for Thermoplastic Accessible and Replaceable Plastic Tube and Tubular Fittings".

E. For public hand washing facilities, provide tempered water through regulating device conforming to ASSE 1070 "Performance Requirements for Water Temperature Limiting Devices", except where an integral temperature-limited faucet is provided.

F. Accessories:
   1. Chrome-plated 17-gage brass P-trap with clean-out plug and arm with escutcheon.
   2. Offset waste with plug and strainer.
   3. Wheel handle stops.
   4. Flexible supplies.
   5. Trap and waste insulated and offset to meet ADA compliance at ADA-accessible lavatories.
   6. Wall Mounted Carrier (Fixture L-2): ASME A112.6.1 "Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use"; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

2.03 SINKS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
   1. American Standard, Inc.
   2. Elkay Manufacturing Co.
   3. Approved Equivalent.

B. Types 302 and 304 stainless steel are used for the sinks specified below.
   1. Single Compartment Sink (Fixture S-3, lab sink): ASME A112.19.3 "Stainless Steel Plumbing Fixtures"; Type 302/304 stainless steel, self-rimming, undercoated, with 3-1/2-

inch crumb cup and tailpiece, ledge back drilled for trim. Basis of Design: Elkay LR2918, or equal approved by Owner. Provide faucet: Basis of Design: Elkay LKE4123, or equal approved by Owner. Provide ASSE 1070 thermostatic mixing valve; Basis of Design: Watts LFUSG-B-SC, or equal approved by Owner.

2. Double Compartment Sink (Fixture S-1): ASME A112.19.3 "Stainless Steel Plumbing Fixtures"; Type 302/304 stainless steel, self-rimming, undercoated, double bowl, with 3-1/2-inch crumb cup and tailpiece at each bowl, ledge back drilled for trim. Basis of Design: Elkay LR33223, or equal approved by Owner. Provide faucet: Basis of Design: Elkay LKE4123, or equal approved by Owner.
3. Exam Sink (Fixture S-2, under-counter): Stainless steel hand sink with deck-mounted faucet. Basis of Design: Advance Tabco 7-PS-60, or equal approved by Owner. Provide ASSE 1070 thermostatic mixing valve; Basis of Design: Watts LFUSG-B-SC, or equal approved by Owner. Provide instantaneous electric water heater IEWH-1 (Eemax AM004120T, 3.5kW, 120V/1ph) under counter at this fixture, specified in Section 224100 - Domestic Water Heaters.

C. Waste Fittings: ASME A112.18.2 "Plumbing Waste Fittings", chrome-plated 17-gage brass P-trap and arm with escutcheon at exposed sink locations.

2.04 SHOWERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Comfort Designs
2. Moen
3. Approved Equivalent.

B. ADA Shower Module (Fixture SH-1): Molded one-piece fiberglass ADA-accessible shower module with integral seat and threshold ramp. Basis of Design: Comfort Designs SSS3636SH, or equal approved by Owner.

C. Shower Valve: ASSE 1016 pressure-balancing type mixing valve with integral service stops, chrome-plated escutcheon and lever handle. Basis of Design: Moen 8370, or equal approved by Owner.

D. Showerhead: Chrome-plated fixed showerhead, maximum 2.5 gpm flow. Basis of Design: Moen 9263, or equal approved by Owner.

E. Hand Shower: ADA-compliant hand-held shower with hose and slide bar, maximum 2.5 gpm flow. Basis of Design: Moen T9346GBM25, or equal approved by Owner.

2.05 DRINKING FOUNTAINS AND BOTTLE FILLERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Elkay Manufacturing Co.
2. Approved Equivalent.

B. Combination Drinking Fountain/Bottle Filler (Fixture DF-1): ARI 1010 "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers"; ADA-compliant, wall-mounted, bi-level, refrigerated combination drinking fountain and bottle filler, stainless steel, with vandal-resistant bubbler, automatic stream regulator, sensor-operated bottle filler with automatic shutoff and filtered water. Basis of Design: Elkay LVRCTL8WSSPRO, or equal approved by Owner.

C. In-Wall Bottle Filler (Fixture BF-1): ADA-compliant, in-wall mounted, non-refrigerated bottle filling station with sensor-operated automatic shutoff. Basis of Design: Elkay LZWS-K, or equal approved by Owner.

PART 3 - EXECUTION

3.01 INSTALLATION

a. Install fixtures level, plumb, and rigidly anchored to supports or building structure per manufacturer's written instructions and ASME A112 series referenced standards.
b. Install fixtures, fittings, and trim in accordance with ANSI A117.1 and applicable accessibility requirements at all ADA-designated fixtures.
c. Provide water hammer arrestors at flushometer-valve fixtures (WC-1, UR-1) and at quick-closing valve fixtures, per General Note 17, Drawing P001, and Section 221000 - Plumbing Piping.
d. Connect trap primer supply piping to floor drains and other primer-connected fixtures; trap primer valves to be electronically operated per General Note 16, Drawing P001.
e. Solidly caulk space between fixtures and walls or floors, in accordance with Section 079200 - Joint Sealants.
f. Install fixture supply stops and traps exposed at accessible fixtures; insulate or enclose exposed hot water and drain piping at ADA lavatories and sinks to prevent contact.

3.02 FIELD QUALITY CONTROL

a. Test fixtures for proper operation after installation and connection. Adjust flush valves, faucets, and mixing valves for proper flow rates and shutoff.

END OF SECTION 22 44 00

SECTION 23 00 00
HEATING, VENTILATING AND AIR CONDITIONING

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Work included in 23 00 00 applies to Division 23 work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of heating, ventilating and air conditioning systems for proposed project.

B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.

C. Definitions:
   1. Provide: To furnish and install, complete and ready for intended use.
   2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
   3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work provided.
   4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent", substitution requests must be submitted to Engineer for consideration, in accordance with Division 01 requirements, and approved by the Engineer prior to submitting bids for substituted items.
   5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's representative, and other reviewing entity whose approval is required to obtain systems acceptance.

1.02 RELATED SECTIONS:

A. Contents of Section applies to Division 23 Contract Documents.

B. Related Work:
   1. Additional conditions apply to this Division including, but not limited to:
      a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
      b. Drawings
      c. Addenda
      d. Owner/Architect Agreement
      e. Owner/Contractor Agreement
      f. Codes, Standards, Public Ordinances and Permits

1.03 REFERENCES AND STANDARDS

A. References and Standards per Division 01, General Requirements, individual Division 23 Sections and those listed in this section.

B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
   1. State of Oregon:
      a. OAR Oregon Administrative Rules
      b. OESC Oregon Electrical Specialty Code
      c. OFC Oregon Fire Code
      d. OMSC Oregon Mechanical Specialty Code
      e. OPSC Oregon Plumbing Specialty Code

f. OSSC Oregon Structural Specialty Code
g. OEESC Oregon Energy Efficiency Specialty Code
h. Oregon Elevator Specialty Code

C. General: Reference standards and guidelines include but are not limited to the latest adopted editions from:
1. ADA Americans with Disabilities Act
2. AHRI Air-Conditioning Heating & Refrigeration Institute
3. AMCA Air Movement and Control Association
4. ANSI American National Standards Institute
5. ASHRAE American Society of Heating, Refrigeration and Air-Conditioning Engineers
6. ASHRAE Guideline 0, The Commissioning Process
7. ASME American Society of Mechanical Engineers
8. ASPE American Society of Plumbing Engineers
9. ASSE American Society of Sanitary Engineering
10. ASTM ASTM International
11. AWWA American Water Works Association
12. CFR Code of Federal Regulations
13. CHPS Collaborative for High Performance Schools
14. CISPI Cast Iron Soil Pipe Institute
15. EPA Environmental Protection Agency
16. ETL Electrical Testing Laboratories
17. FM FM Global
18. GAMA Gas Appliance Manufacturers Association
19. IAPMO International Association of Plumbing & Mechanical Officials
20. ISO International Organization for Standardization
21. LEED Leadership in Energy and Environmental Design
22. MSS Manufacturers Standardization Society
23. NEC National Electric Code
24. NEMA National Electrical Manufactures Association
25. NFPA National Fire Protection Association
26. NFGC National Fuel Gas Code
27. OSHA Occupational Safety and Health Administration
28. SMACNA Sheet Metal and Air Conditioning Contractors' National Association, Inc.
29. TEMA Tubular Exchanger Manufactures Association
30. TIMA Thermal Insulation Manufactures Association
31. UL Underwriters Laboratories, Inc.

D. See Division 23 individual sections for additional references.

E. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.

F. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.

G. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials across the board.

1.04 SUBMITTALS

A. See Division 01, General Requirements for Submittal Procedures as well as specific individual Division 23 sections.

B. Provide product submittals and shop drawings in one copy in paper format with electronic backup. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one zip file per specification division containing a separate file for each specification section. For paper format, provide one common binder per specification division, with tabbed dividers for each specification section. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.

C. Product Data: Provide Manufacturer's descriptive literature for products specified in Division 23 sections.

D. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the Specifications and Drawings.
   1. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.
   2. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 23 Specification sections for specific items required in product data submittal outside of these requirements.
   3. Provide pump curves, operation characteristics, capacities, ambient noise criteria, etc. for equipment.
   4. For vibration isolation of equipment, list make and model selected with operating load and deflection.
   5. See Division 23 individual sections for additional submittal requirements.

E. Maximum of two reviews of submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of these additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.

F. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet Section 23 05 48 requirements for non-structural components. Provide engineered seismic drawings and equipment seismic certification. Refer to structural for building occupancy and seismic design category.

G. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required by Division 23 Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26 submittals.

H. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.

I. Substitutions and Variation from Basis-of-Design:
   1. Basis-of-Design systems, components and controls for equipment are selected and sized based on the equipment specified as the first-named, model number and supplemental additional options as indicated in the Contract Documents. If substitutions and/or equivalent equipment/products proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for the equipment being furnished. No additional charges above the Base Bid will be allowed for such revisions. Coordinate with the requirements of "Submittals". For

any product marked "or approved equivalent", a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

J. Shop Drawings: Provide coordinated shop drawings which include physical characteristics of all systems, equipment, ductwork and piping layout plans, and control wiring diagrams. Reference individual Division 23 Specification sections for additional requirements for shop drawings outside of these requirements.
   1. Provide Shop Drawings indicating access panel locations for items that require Code or maintenance access, size and elevation for approval prior to installation.

K. Samples: Provide samples when requested by individual sections.

L. Resubmission Requirements:
   1. Make any corrections or change in submittals when required. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
      a. Resubmit for review until review indicates no exceptions taken or make "corrections as noted".
      b. When submitting drawings for Engineers re-review, clearly indicate changes on drawings and "cloud" any revisions. Submit a list describing each change.

M. Operation and Maintenance Manuals, Owners Instructions:
   1. Submit, at one time, one bound copy of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Include valve charts. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
      a. Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
      b. Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: belts, motors, lubricants, and filters.
      c. Include Warranty per Division 00 and Division 01, Section 23 00 00 and individual sections.
      d. Include product certificates of warranties and guarantees.
      e. Include copy of complete parts list for equipment. Include available exploded views of assemblies and sub-assemblies.
      f. Include copy of startup and test reports specific to each piece of equipment.
      g. Include copy of final air and water systems balancing log along with pump, fan and distribution system operating data.
      h. Include commissioning reports.
      i. Include copy of valve charts/schedules.
      j. Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews. Contractor to bear costs for additional reviews at Engineer's hourly rates.
   2. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual sections, training will include classroom instruction with applicable training aids and systems demonstrations. Field instruction per Section 23 00 00 Article titled "Demonstration".

3. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

N. Record Drawings:
1. Maintain at site at least one set of drawings for recording “As-constructed” conditions. Indicate on drawings changes to original documents by referencing revision document, and include buried elements, location of cleanouts, and location of concealed mechanical items. Include items changed by field orders, supplemental instructions, and constructed conditions.
2. Record Drawings are to include equipment and fixture/connection schedules, control dampers, fire smoke dampers, fire dampers, valves, bottom of pipe, duct and equipment elevations and dimensioned locations for all distribution systems (air). Invert elevations and dimensioned locations for underground systems below grade to 5-feet outside building that accurately reflect "as constructed or installed" for project.
3. At completion of project, input changes to original project CAD Drawings and make one set of black-line drawings created from CAD Files in version/release equal to contract drawings. Submit CAD disk and drawings upon substantial completion.
4. See Division 23 individual sections for additional items to include in record drawings.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements: Work and materials installed to conform with all local, State, Federal and other applicable laws and regulations.

B. Drawings are intended to be diagrammatic and reflect the Basis-of-Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., piping, etc.) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis-of-Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.

C. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.

D. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.

E. UL Compliance: Provide products which are UL listed.

1.06 WARRANTY

A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 01, Section 23 00 00 and individual Division 23 sections.

B. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01 and the General Conditions. Confirm requirements in all Contract Documents.

1.07 COORDINATION DOCUMENTS

A. Prior to construction, coordinate installation and location of HVAC equipment, ductwork, grilles, diffusers, piping, equipment, fire sprinklers, plumbing, cable trays, lights, and electrical services with architectural and structural requirements, and other trades (including ceiling suspension, and tile systems), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted,

including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence.

B. Advise Architect in event a conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.

C. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.

D. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

1.08 EXAMINATION OF THE SITE

A. Prior to submitting a bid, the Contractor shall visit the site and thoroughly investigate locations, connections and details of all services and systems that would in any way affect or tie-in with work of these drawings. No extras will be allowed for work resulting from conditions that would have been evident upon a thorough examination of the site. Notify the Architect prior to bid closing date of any discrepancies or points of doubt or contention. Failing this action, include in the bid for the most expensive course if action.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Provide like items from one manufacturer, including but not limited to pumps, fans, valves, control devices, air handlers, vibration isolation devices, etc.

2.02 MATERIALS

A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Provide all materials omitted herein but necessary to complete the work.

B. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer.

C. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.

D. Hazardous Materials:
   1. Comply with local, State of Oregon, and Federal regulations relating to hazardous materials.
   2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.
   3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

2.03 ACCESS PANELS

A. See Division 01, General Requirements and Division 08 for products and installation requirements.

B. Confirm Access Panel requirements in Division 01, Division 08 and individual Division 23 sections. In absence of specific requirements in Division 01, comply with the following:
   1. Provide flush mounting access panels for service of systems and individual components requiring maintenance or inspection. Where access panels are located in fire-rated assemblies of building, rate access panels accordingly. Ceiling access panels to be

minimum of 24 x 24 or as required and approved size. Wall access panels to be minimum of 12 x 12 or as required and approved size.

a. Provide two keys for each set of screwdriver operated catch.
    1) Drywall: Karp KDW.
    2) Plaster: Karp DSC-214PL.
    3) Masonry: Karp DSC-214M.
    4) 2 hour rated: Karp KPF-350FR.
    5) Manufacturers: Karp, Milcor, Elmdor, Acudor or approved equivalent.

2.04 STARTERS, SWITCHES AND DISCONNECTS

A. All mechanical equipment motor starters, switches and disconnects, other than those that are integral, or provided as part of an equipment package, are by Division 26, Electrical

2.05 GUARDS

A. Provide guards in accordance with State Safety Code and OSHA requirements over all rotating equipment including belts, shafts and couplings. Drive guards over belts and sheaves shall include 2-1/2” diameter access opening at shaft ends for speed counter.

2.06 PENETRATION FIRE STOPPING

A. Through-penetration fire stopping system tested and listed by Underwriters Laboratories. 3M, Metacaulk, SpecSeal, or approved equivalent.

B. Select system for proper application based on wall construction, type of penetrating item, wall rating, etc.

2.07 MISCELLANEOUS STEEL

A. Provide all steel as required for adequate support of all mechanical equipment. Use standard angle or channel, I or H sections as required by application. Adequately cross-braced and welded pipe stands may be used for tank supports. Provide suitable base plates for all stands and anchors for all hanging equipment. Drill or burn support holes in only flanges of structural shapes and only in one leg of any one angle, and as far from center of length as possible.

B. Paint: Apply one coat of black Rustoleum primer to shop fabricated items before delivery to the job; other painting as specified herein.

PART 3 - EXECUTION

3.01 ACCESSIBILITY AND INSTALLATION

A. Confirm Accessibility and Installation requirements in Division 00 and Division 01, Section 23 00 00 and individual Division 23 sections.

B. Install equipment having components requiring access (i.e., drain pans, drains, control operators, valves, motors and vibration isolation devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.

C. Install equipment and products complete as directed by manufacturer's installation instructions including all appurtenances recommended in manufacturer's installation instructions, at no additional charge to Owner. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to

proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.

D. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 23 sections and the following:
   1. Earthwork:
      a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork sections. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
      b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
      c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.

E. Confirm Firestopping requirements in Division 07. In absence of specific requirements, comply with individual Division 23 sections and the following:
   1. Firestopping:
      a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
      b. Install specified penetrating item with required annular spacing in proper size wall or floor opening. Support penetrating item adequately on both sides of construction.
      c. Clean all opening and penetrating item surfaces in penetration area to remove loose debris, dirt, oil, wax, grease, old caulking, etc.
      d. If needed or required for gypsum or concrete block walls, install specified galvanized steel wire mesh or sleeve recessed and centered inside wall around penetrating item so that it is snug against perimeter of opening.
      e. When required, install specified type and depth of backing material in annular space, recessed to required fill depth of firestopping caulking.
      f. Gun, trowel, and/or pump firestopping sealant to specified depth in annular space around penetrating item. Trowel sealant surfaces flush with wall or floor surfaces to a smooth, defect-free finish. Where required, apply specified size caulking bead around penetrating item at zero annular contact areas and tool smooth.

F. Pipe Installation:
   1. Coordinate work to account for expansion and contraction of piping materials and building, as well as anticipated settlement or shrinkage of building. Install work to prevent damage to piping, equipment, and building and its contents. Provide piping offsets, loops, seismic flexible joints, expansion joints, sleeves, anchors or other means to control pipe movement and minimize forces on piping. Verify anticipated settlement and/or shrinkage of building. Verify construction phasing, type of building construction products and rating for coordinating installation of piping systems.
   2. Include provisions for servicing and removal of equipment without dismantling piping.

G. Plenums:
   1. In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

3.02 SEISMIC CONTROL

A. Confirm Seismic Control requirements in Division 01, Section 23 00 00 and individual Division 23 sections.

B. General:
   1. Seismic Design Category: Refer to structural.

2. Building Category: Refer to structural.
3. Importance Factor (I-p): Refer to structural.
4. Earthquake resistant designs for HVAC (Division 23) equipment and distribution, i.e. motors, ductwork, piping, equipment, etc. conform to regulations of jurisdiction having authority.
5. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
6. Provide stamped shop drawings from licensed structural engineer of seismic bracing and seismic movement assemblies for piping, ductwork, equipment, and system appurtenances. Submit shop drawings along with equipment submittals.
7. Provide stamped shop drawings from licensed Structural Engineer of seismic flexible joints for system crossing building expansion or seismic joints. Submit shop drawings along with seismic bracing details. Coordinate exact design requirements with project Structural Engineer.

C. Piping and Ductwork:
1. Per "Seismic Restraints Manual Guidelines for Mechanical Systems" latest edition published by SMACNA or local requirements.

D. Equipment:
1. Provide means to prohibit excessive motion of equipment during earthquake.

3.03 REVIEW AND OBSERVATION

A. Confirm Review and Observation requirements in Division 00, Division 01, Section 23 00 00 and individual Division 23 Sections.

B. Notify Architect, in writing, at following stages of construction so that Architect may, at their option, visit site for review and construction observation:
1. Underground system installation prior to backfilling.
2. Prior to covering walls.
3. Prior to ceiling cover/installation.
4. After major equipment is installed.
5. When main systems, or portions of, are being tested and ready for inspection by AHJ.
6. Final Punch:
a. Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.04 CONTINUITY OF SERVICE

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 23 sections and the following:
1. During remodeling or addition to existing structures, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new piping and ductwork, and wiring to point of connection. Where existing systems are being utilized, clean existing distribution systems (ductwork, piping, fans, air handlers) prior to connecting new ductwork or piping.
3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum.
a. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.

4. Organize work to minimize duration of power interruption.

3.05 CUTTING AND PATCHING

A. Confirm Cutting and Patching requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 23 sections and the following:
   1. Proposed floor cutting/core drilling/sleeve locations to be approved by project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
   2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section and will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
   3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.
   4. Restore new or existing work that is cut and/or damaged to original condition. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
   5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.06 EQUIPMENT SELECTION AND SERVICEABILITY

A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

B. Maintain design intent where equipment other than as shown as Basis-of-Design in Contract Documents is provided. Where equipment requires ductwork or piping arrangement, controls/control diagrams, or sequencing different from that indicated in Contract Documents, provide at no additional cost to Owner.

3.07 DELIVERY, STORAGE AND HANDLING

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 23 sections and the following:
   1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt, and/or dust as a result of improper storage to be replaced before installation.
   2. Protect equipment and pipe to avoid damage. Close pipe openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.
   3. Protect bright finished shafts, bearing housings and similar items until in service.

3.08 DEMONSTRATION

A. Confirm Demonstration requirements in Division 00 and Division 01, Section 23 00 00 and individual Division 23 Sections.

B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field

instruction to Owner's Maintenance Staff as specified in Division 01, Section 23 00 00 and individual Division 23 sections.

C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.09 CLEANING

A. Confirm Cleaning requirements in Division 01, Section 23 00 00 and individual Division 23 sections.

B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

A. Confirm Installation requirements in Division 00, Division 01, Section 23 00 00 and individual Division 23 sections.

B. Install equipment and fixtures in accordance with manufacturer's installation instructions, plumb and level and firmly anchored to vibration isolators. Maintain manufacturer's recommended clearances.

C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
   1. Do not place equipment in sustained operation prior to initial balancing of HVAC systems.

D. Provide miscellaneous supports/metals required for installation of equipment, piping and ductwork.

3.11 PAINTING

A. Confirm Painting requirements in Division 01 and Division 09. In absence of specific requirements, comply with individual Division 23 sections and the following:
   1. Ferrous Metal: After completion of work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in mechanical rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black enamel for interior suitable for hot surfaces.
   2. After acceptance by Authority Having Jurisdiction (AHJ), in a mechanical room, on roof or other exposed areas, machinery and equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
   3. See individual equipment Specifications for other painting.
   4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
   5. Piping and Ductwork: Clean, primer coat and paint exposed piping and ductwork on roof or at other exterior locations with two coats paint suitable for metallic surfaces and exterior exposures. Color selected by Architect.
   6. Covers: Covers such as manholes, cleanouts and the like will be furnished with finishes which resist corrosion and rust.

3.12 ACCESS PANELS

A. Confirm Access Panel requirements in Division 01. In absence of specific requirements, comply with individual Division 23 sections and the following:

1. Coordinate locations/sizes of access panels with Architect prior to work.

3.13 DEMOLITION

A. Confirm requirements in Division 01 and Division 02. In absence of specific requirements, comply with individual Division 23 sections and the following:
   1. Scope:
      a. It is the intent of these documents to provide necessary information and adjustments to the HVAC system required to meet code, and accommodate installation of new work.
      b. Coordinate with Owner so that work can be scheduled not to interrupt operations, normal activities, building access or access to different areas.
      c. Existing Conditions: Determine exact location of existing utilities and equipment before commencing work, compensate Owner for damages caused by failure to exactly locate and preserve utilities. Replace damaged items with new material to match existing. Promptly notify Owner if utilities are found which are not shown on Drawings.
   2. Equipment: Unless otherwise directed, equipment, fixtures, or fittings being removed as part of demolition process are Owner's property. Remove other items not scheduled to be reused or relocated from job site as directed by Owner.
   3. Unless specifically indicated on Drawings, remove exposed, unused ductwork and piping to behind finished surfaces (floor, walls, ceilings, etc.). Cap and patch surfaces to match surrounding finish.
   4. Unless specifically indicated on Drawings, remove unused equipment, fixtures, fittings, rough-ins, and connectors. Removal is to be to a point behind finished surfaces (floors, walls, and ceilings).

3.14 ACCEPTANCE

A. Confirm requirements in Division 00 and Division 01. In absence of specific requirements, comply with individual Division 23 sections and the following:
   1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
      a. Testing and Balancing Reports
      b. Cleaning
      c. Operation and Maintenance Manuals
      d. Training of Operating Personnel
      e. Record Drawings
      f. Warranty and Guaranty Certificates
      g. Start-up/Test Document
      h. Commissioning Reports

3.15 FIELD QUALITY CONTROL

A. Confirm Field Quality Control requirements in Division 01, Section 23 00 00 and individual Division 23 sections.

B. Tests:
   1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification sections for required tests. Document tests and include in Operation & Maintenance Manuals.
   2. During site evaluations by Architect or Engineer, provide an electrician with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3. In order to avoid damage or out-of-range operation upon start-up or during testing, each system or piece of equipment shall initially be set up in its approximately correct calibration or operating position, unless pre-calibrated or precisely arranged as received on the job.
4. Each sub-system or section shall be tested prior to concealment, burial, or covering. Provide all test plugs, section valves, caps, ports, drain and fill provisions, instrumentation, or fittings necessary for testing of systems or equipment.
5. All equipment and each system shall be tested throughout its entire range of operation prior to final acceptance of the work. Operation shall be tested in all available modes, including testing or simulation of emergency or abnormal modes to demonstrate proper operation of out-of-range limits, fusing, alarms, cutouts, or other protective features.
6. Provide all materials and utilities, either temporary or permanent, necessary for testing, including both re-usable and consumable supplies.
7. Adjust all motorized dampers, valves, stops, regulators, flows, levels, or other items requiring adjustment for normal operation.
8. Check, adjust, and record belt tensions, motor speeds, amperage draws, high- and low-limits, or other variable or adjustable settings, to within ranges recommended for the application.
9. Upon completion of all testing and prior to air balancing, replace all air filters in air moving equipment that was used during the construction period.

3.16 LETTER OF CONFORMANCE

A. Provide Letter of Conformance and copies of manufacturers' warranties and extended warranties with a statement that fire suppression items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance and copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

3.17 ELECTRICAL INTERLOCKS

A. Where equipment motors are to be electrically interlocked with other equipment for simultaneous operation, utilize equipment wiring diagrams to coordinate with electrical systems so that proper wiring of equipment involved is affected.

END OF SECTION 23 00 00

SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.01SUMMARY

A. Work Included: Provision of materials, installation and testing of:
   1. Piping and Ductwork Hangers and Supports

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. ASME 7-05, Chapter 13.
   2. Terminology: As defined in MSS SP-90 "Guidelines on Terminology for Pipe Hangers and Supports".
   3. Install ductwork per SMACNA's requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   2. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support, trapeze, duct support equipment hangers/supports, and seismic restraint by a qualified Structural Professional Engineer.
      a. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of hangers and supports that are similar to those indicated for this Project in material, design, and extent.
   3. Manufacturers regularly engaged in the manufacture of bolted metal framing support systems, whose products have been in satisfactory use in similar service for not less than 10 years.
   4. Support systems to be supplied by a single manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

1.07 PERFORMANCE REQUIREMENTS

A. General - Provide pipe, ductwork and equipment hangers and supports in accordance with the following:
   1. When supports, anchorages, and seismic restraints for equipment, and supports, anchorages, and seismic restraints for conduit, piping, and ductwork are not shown on the Drawings, the contractor is responsible for their design.
   2. Connections to structural framing not to introduce twisting, torsion, or lateral bending in the framing members. Provide supplementary steel as required.

B. Engineered Support Systems:
   1. Support frames such as pipe racks or stanchions for piping, ductwork and equipment which provide support from below.
   2. Equipment, ductwork and piping support frame anchorage to supporting slab or structure.

C. Provide channel support systems for ductwork and equipment supports capable of supporting the combined weight of supported systems and system contents.

D. Provide seismic restraint hangers and supports for piping, ductwork and equipment. See Section 23 05 48.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Pipe and Ductwork Hangers and Supports:
   1. B-Line Systems, Inc.
   2. Anvil Corp.
   3. Erico Co., Inc.
   4. Approved Equal

2.02 PIPING AND DUCTWORK HANGERS AND SUPPORTS

A. Horizontal Piping Hangers and Supports - Horizontal and Vertical Piping, and Hanger Rod Attachments:
   1. Factory fabricated horizontal piping hangers and supports complying with MSS SP-58, to suit piping systems, in accordance with MSS SP-69 and manufacturer's published product information.
   2. Use only one type by one manufacturer for each piping service.
   3. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping.
   4. Provide copper-plated hangers and supports for uninsulated copper piping systems.

B. Pipe Hangers, Slides and Clamps:
   1. Hanger Rods: Hanger rods continuously threaded or threaded ends only in concealed spaces and threaded ends only in exposed spaces; finish electro-galvanized or cadmium-plated in concealed spaces and prime painted in exposed spaces; sizes per NSS.
   2. Hanger Rod Couplings: Anvil Figure 136, B-Line Figure B3220, or approved equivalent; malleable iron rod coupling with elongated center sight gap for visual inspection; to have same finish as hanger rods.
   3. Pipe Rings for Hanger Rods: Pipe sizes 2-inch and smaller, Anvil Figures 69 or 104, or equivalent of Erico Hanger or approved equivalent. Pipe sizes 2-1/2-inches and larger, clevis type hangers with adjustable nuts on rod. Anvil figure 260. Pipe rings to have same finish as hanger rods.

4. Pipe Slides: Anvil mfr, reinforced teflon slide material (3/32-inch minimum thickness) bonded to steel; highly finished steel or stainless steel contact surfaces to resists corrosion; 60-80 PSI maximum active contact surface loading; steel parts 3/16-inch minimum thickness; attachment to pipe and framing by welding.

5. Pipe Guides:

a. Furnish and install pipe guides on continuous runs where pipe alignment must be maintained. Minimum two on each side of expansion joints, spaced per manufacturer's recommendations for pipe size. Fasten guides securely to pipe and structure. Contact with chilled water pipe not to permit heat to be transferred in sufficient quantity to cause condensation on any surface.

b. Furnish and install guides approximately 4 pipe diameters (first guide) and 14 diameters (second guide) away from each end of expansion joints. Guides are not to be sued as supports and are in addition to other pipe hangers and supports.

6. Channel Type Pipe Hanging System: Framing members No. 12 gauge formed steel channels, 1-5/8-inch square, conforming to ASTM A570 GR33, one side of channel to have a continuous slot with in turned lips; framing nut with grooves and spring 1/2-inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A307; fittings conforming to ASTM A575; parts enamel painted or electro-galvanized.

C. Building Attachments:
1. Factory fabricated attachments complying with MSS SP-58, selected to suit building substructure conditions, in accordance with MSS SP-69 and manufacturer's published product information.
2. Select size of building attachments to suit hanger rods.

D. Beam Clamps:
1. MSS Type 19 and 23, wide throat, with retaining clip.
2. Universal Side Beam Clamp: MSS Type 20.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify building materials to have hangers and attachments affixed in accordance with hangers to be used. Provide supporting calculations.

3.02 PREPARATION

A. Examine Drawings and coordinate for verification of exact locations of fire and smoke rated walls, partitions, floors and other assemblies. Indicate, by shading and labeling on Record Drawings such locations and label as "1-Hour Wall," "2-Hour Fire/Smoke Barrier," and the like. Determine proper locations for piping penetrations. Set sleeves in place in new floors, walls or roofs prior to concrete pour or grouting.

B. Install hangers, supports, anchors and sleeves after required building structural work has been completed in areas where the work is to be installed. Coordinate proper placement of inserts, anchors and other building structural attachments.

3.03 FABRICATION - MISCELLANEOUS METALS

A. General: Verify dimensions prior to fabrication. Form metal items to accurate sizes and configurations as indicated on drawings and otherwise required for proper installation; make with lines straight and angles sharp, clean and true; drill, countersink, tap, and otherwise prepare items for connections with work of other trades, as required. Fabricate to detail of structural shapes, plates and bars; weld joints where practicable; provide bolts and other

connection devices required. Include anchorages; clip angles, sleeves, anchor plates, and similar devices. Hot dipped galvanize after fabrication items installed in exterior locations. Set accurately in position as required and anchor securely to building construction. Construct items with joints formed for strength and rigidity, accurately machining for proper fit; where exposed to weather, form to exclude water.

B. Finishes:
   1. Ferrous Metal: After fabrication, but before erection, clean surfaces by mechanical or chemical methods to remove rust, scale, oil, corrosion, or other substances detrimental to bonding of subsequently applied protective coatings. For metal items exposed to weather or moisture, galvanize in manner to obtain G90 zinc coating in accordance with ASTM A123. Provide other non-galvanized ferrous metal with 1 coat of approved rust-resisting paint primer, in manner to obtain not less than 1.0 mil dry film thickness. Touch-up damaged areas in primer with same material, before installation. Apply zinc coatings and paint primers uniformly and smoothly; leave ready for finish painting as specified elsewhere.
   2. Metal in contact with Concrete, Masonry and Other Dissimilar Materials:
      a. Where metal items are to be erected in contact with dissimilar materials, provide contact surfaces with coating of an approved zinc-chromate primer in manner to obtain not less than 1.0 mil dry film thickness, in addition to other coatings specified in these specifications.
   3. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

3.04 INSTALLATION

A. Building Attachments:
   1. Install within concrete or on structural steel or wood. Attachment to Wood Structure: Anvil side beam bracket Figure 202 for attachment to wooden beam or approved attachment for a wood structure.
   2. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping.
   3. Install concrete inserts before concrete is placed; fasten insert secure to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top in inserts.

B. Hangers and Supports:
   1. Steel Backing in Walls: Provide steel backing in walls to support fixtures and piping hung from steel stud walls.
   2. Channel Support System Installation: Arrange for grouping of parallel runs of ductwork and equipment supports together on field-assembled channel systems.
      a. Field assemble and install according to manufacturer's written instructions.
   3. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including ductwork fittings, equipment connections, and changes in direction. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
   4. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
   5. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
   6. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

7. Install hangers and supports to allow controlled thermal and seismic movement of ductwork and equipment, to permit freedom of movement between anchors, and to facilitate action of expansion joints and similar units.
8. Load Distribution: Install hangers and supports so that ductwork and equipment live and dead loads and stresses from movement will not be transmitted to connected equipment.
9. Equipment Clearances: Do not route ductwork, equipment, or piping through electrical rooms, transformer vaults, elevator equipment rooms, IT rooms, MPOE rooms, or other electrical or electronic equipment spaces and enclosures and the like. Within equipment rooms, provide minimum 3-feet lateral clearance from all sides of electric switchgear panels. Do not route ductwork, equipment, or piping above any electric power or lighting panel, switchgear, or similar electric device. Coordinate with Electrical and coordinate exact ductwork, equipment or pipe routing to provide proper clearance with such items.
10. Hanger Spacing per more stringent of Code requirements.
11. See Section 23 31 00, HVAC Ducts and Casings for additional hanging and support requirements for ductwork.

C. Bolting:
1. General: Provide bored, drilled or reamed holes for bolting to miscellaneous structural metals, frames or for mounts or supports. Flame cut, punched or hand sawn holes will not be accepted.

D. Anchor Bolts:
1. General: Install anchor bolts for mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at equipment support points. Provide locknuts where equipment, piping and ductwork are hung.
2. Anchor bolts (Cast-In-Place): Embed anchor bolts in new cast-in-place concrete to anchor equipment. Install a pipe sleeve around the anchor bolt for adjustment of the top 1/3 of the bolt embedment; sizes and patterns to suit the installation conditions of the equipment to be anchored.

E. Escutcheon Plates: Install around horizontal and vertical piping at visible penetrations through walls, partitions, floors, or ceilings, including penetrations through closets, through below ceiling corridor walls, and through equipment room walls and floors.

F. "Link-Seal" Pipe Sleeves: Install at floor/below grade piping penetrations. Provide manufacturer's sleeve appropriate to seal type for pre-cast penetrations.

G. Fabricated Pipe Sleeves:
1. Provide either steel or sheet metal pipe sleeves accurately centered around pipe routes. Size such that piping and insulation, if any, will have free movement within the sleeve, including allowance for thermal expansion. Sleeve diameter to be determined by local seismic clearance requirements, and by waterproofing requirements.
2. Length: Equal to thickness of construction penetrated, except extend floor sleeves 1-inch above floor finish.
3. Provide temporary support of sleeves during placement in concrete and other work around sleeves. Provide temporary end closures to prevent concrete and other materials from entering pipe sleeves.
4. Seal each end airtight with a resilient nonhardening sealer, UL listed, fire rated ASTM 814..

H. Installation of metallic or plastic piping penetrations through non fire-rated walls and partitions and through smoke-rated walls and partitions:
1. Install fabricated pipe sleeve.
2. After installation of sleeve and piping, tightly pack entire annular void between piping or piping insulation and sleeve I.D. with specified material.
3. Seal each end airtight with a resilient nonhardening UL listed fire resistant ASTM 814.

I. Piping penetrations through fire-rated (1 to 3 hour) assemblies:

1. Select and install pre-engineered pipe penetration system in accordance with the UL listing and manufacturer's recommendation.
2. Provide proper sizing when providing sleeves or core-drilled holes to accommodate the penetration. Firestop voids between sleeve or core-drilled hole and pipe passing through to meet the requirements of ASTM E814.

3.05 MISCELLANEOUS METALS

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required. Avoid cutting concrete reinforcing when drilling for inserts. Reference structural drawings and reinforcing shop drawings and determine locations of stirrups prior to drilling into concrete.

C. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items, which are to be built into concrete masonry or similar construction.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

E. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
   1. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.06 ADJUSTING AND PAINTING

A. Adjust hangers so as to distribute loads equally on attachments. Provide grout under supports to bring piping, ductwork and equipment to proper level and elevations.

B. Prime paint ferrous nongalvanized hangers, accessories, and supplementary steel which are not factory painted.

3.07 FLASHING

A. Flash and counterflash where piping, ductwork and equipment passes through weather or waterproofed walls, floors, and roofs.

B. Provide 12-inches minimum height curbs for roof-mounted mechanical equipment. Flash and counter flash with galvanized steel, soldered and waterproofed.

3.08 METAL FABRICATION

A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.

B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.09 TESTING

A. Powder-Actuated Inserts: Test powder-actuated insert attachments with a minimum load of 100 pounds.

END OF SECTION 23 05 29

SECTION 23 05 53
IDENTIFICATION FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: Provision of materials, installation and testing of:
   1. Plastic Nameplates
   2. Tags
   3. Plastic Duct Markers
   4. Lettering and Graphics

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:
   1. Schedules:
      a. Submit identification schedule listing nameplate, tag, and duct marker legend for equipment and ductwork, in tabular format using Microsoft Word or Excel software. Furnish extra copies for maintenance manuals.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer's Qualifications: Firms regularly engaged in manufacture of identification devices of types and sizes required.
   2. Codes and Standards: Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices unless otherwise indicated.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. General: Manufacturer's standard products of categories and types required for each application as referenced in other Division 23 sections. Where more than a single type is specified for application, provide single selection for each product category.

B. Manufacturers:
   1. Brady Corporation

2. Champion America, Inc.
3. Seton Identification Products
4. Craftmark
5. Brimer
6. Or approved equivalent.

2.02 PLASTIC NAMEPLATES

A. Description: Engraving stock melamine plastic laminate, Federal Specification L-P-387, in the size and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color), punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Provide 1/8-inch thick material.
   1. Letter Color: White.
   2. Letter Height: 1/2-inch.
   3. Background Color: Black.
   4. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.
   5. Access Panel Markers: Manufacturer's standard 1/16-inch thick engraved plastic laminate access panel markers, with abbreviations and numbers corresponding to concealed valve or devices/equipment. Include center hole to allow attachment.

2.03 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved white letters on black contrasting background color. Tag size minimum 1-1/2-inch diameter.

B. Metal Tags: Polished Brass with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.

C. Warning Tags: Preprinted or partially preprinted, accident-prevention tags; of plasticized card stock with matte finish suitable for writing.
   1. Size: Approximately 4 by 7-inches.
   2. Fasteners: Brass grommet and wire.
   3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
   4. Color: Yellow background with black lettering.

2.04 PLASTIC DUCT MARKERS

A. General: Manufacturer's standard laminated plastic, color-coded duct markers. Supply separate color codes for supply, return, exhaust, and outside air systems.

B. Include the Following Nomenclature:
   1. Direction of air flow.
   2. Duct service (supply, return, general exhaust, outside air).

2.05 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in mechanical identification work with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

B. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Rooftop Unit No. 3, Exhaust Fan No. 2, and the like).

PART 3 - EXECUTION

3.01 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including equipment tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. Coordinate with the facility maintenance personnel to insure consistency with the existing tagging system.

C. Tag balancing dampers with balanced CFM indicated after balancing is completed and accepted.

D. Install plastic nameplates with corrosive-resistant mechanical fasteners.

E. Install tags with corrosion resistant chain.

F. Identify rooftop units, exhaust fans, and electric wall heater with plastic nameplates riveted to equipment body. Small devices may be identified with tags.

G. Identify control panels and major control components outside panels with plastic nameplates riveted to equipment body.

H. Identify thermostats with nameplates.

I. Tag automatic controls, instruments, and relays. Key to control schematic.

J. Identify ductwork with plastic ductmarkers. Identify air supply, return, and exhaust ductwork with duct markers, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork identification color). Identify with rooftop unit or exhaust fan identification number and area served. Locate identification at each unit, in mechanical rooms, at each side of penetration of structure or enclosure, at each obstruction, and within view of access doors/panels. In each space where ductwork is exposed, locate signs near points where ductwork originates or continues into concealed enclosures (shaft or similar concealment) and at 50 foot spacing along exposed runs. Where noted on plans, identify ductwork in exposed/public locations.

K. Access Doors: Provide duct markers or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions.

L. Provide ceiling tags to locate dampers above accessible ceilings. Locate in corner of ceiling tee grid closest to equipment.

M. Manual Balancing Dampers: Provide orange 12-inch plenum-rated marker ribbon to end of balancing damper handle.

END OF SECTION 23 05 53

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.01SUMMARY

A. Work Included: Provision of materials, installation and testing of:
   1. Taking pre-tests of existing systems as identified on drawings.
   2. Balancing airflow within distribution systems, including sub-mains, branches, and terminals, to indicated quantities according to specified tolerances and the Ventilation Schedule and equipment schedules on Drawing M001.
   3. Adjusting total HVAC systems to provide indicated quantities.
   4. Measuring electrical performance of HVAC equipment.
   5. Setting quantitative performance of HVAC equipment.
   6. Verifying that automatic control devices are functioning properly.
   7. Reporting results of the activities and procedures specified in this Section.

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:
   1. Quality-Assurance Submittals: Submit two copies of evidence that the testing, adjusting, and balancing Agent and this Project's testing, adjusting, and balancing team members meet the qualifications specified in the "Quality Assurance" Article below.
   2. Strategies and Procedures Plan: Submit two copies of the testing, adjusting, and balancing strategies and step-by-step procedures as specified in Part 3 below. Include a complete set of report forms intended for use on this Project.
   3. Certified Testing, Adjusting, and Balancing Reports: Submit two copies of reports prepared, as specified in this Section, on approved forms certified by the testing, adjusting, and balancing Agent.
   4. Provide additional submittals to commissioning authority as dictated in commissioning specifications.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Acceptable Balance Firm:
      a. General:
         1) Procure services of independent balance and testing agency, approved by Architect, which specializes in balancing and testing of heating, ventilating, and air conditioning systems, to balance, adjust and test air moving equipment and air distribution or exhaust systems. Minimum Experience: 5 years.
      b. Industry Standards: Testing and Balancing will conform to NEBB, American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) as follows:

1) NEBB: Comply with Procedural Standards for Testing, Adjusting Balancing of Environmental Systems.
2) ASHRAE: Comply with recommendations pertaining to measurements, instruments, and testing, adjusting and balancing.

c. Test Observation: If requested, conduct tests in the presence of the Architect or the Architect's representative.

2. Provide proof of testing agency having successfully completed at least five projects of similar size and scope.
3. Code Compliance: Perform tests in the presence of the Authority Having Jurisdiction (AHJ) where required by the Authority Having Jurisdiction (AHJ).
4. Owner Witness: Perform tests in the presence of the Owners representative.
5. Do not perform testing, adjusting, and balancing work until heating, ventilating, and air conditioning equipment has been completely installed and is operating continuously as required.
6. Conduct air testing and balancing with clean filters in place.
7. Agent Qualifications: Engage a testing, adjusting, and balancing agent certified by AABC or NEBB.
8. Certification of Testing, Adjusting, and Balancing Reports: Certify the testing, adjusting, and balancing field data reports. This certification includes the following:
   a. Review field data reports to validate accuracy of data and to prepare certified testing, adjusting, and balancing reports.
   b. Certify that the testing, adjusting, and balancing team complied with the approved testing, adjusting, and balancing plan and the procedures specified and referenced in this Specification.
9. Testing, Adjusting, and Balancing Reports: Use standard forms from AABC's "National Standards for Testing, Adjusting, and Balancing" and/or standard forms from NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."
10. Instrumentation Type, Quantity, and Accuracy: As described in AABC national standards, and/or as described in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification."
11. Instrumentation Calibration: Calibrate instruments at least every 6 months or more frequently if required by the instrument manufacturer.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:
   1. TAB Agency provides warranty for a period of 90 days following submission of completed report, during which time, Owner may request a recheck of up to 10 percent of total number of terminals, or resetting of any outlet, coil, or device listed in the final TAB report.
   2. Guarantee: Meet the requirements of the following programs:
      a. Provide a guarantee on AABC or NEBB forms stating that the agency will assist in completing the requirements of the Contract Documents if the testing, adjusting, and balancing Agent fails to comply with the Contract Documents. Guarantee includes the following provisions:
         1) The certified Agent has tested and balanced systems according to the Contract Documents.
         2) Systems are balanced to optimum performance capabilities within design and installation limits.

1.07 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to design quantities.

C. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a persons skin than is normally dissipated.

D. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

E. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

F. TAB: Testing and Balancing.

G. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

H. Testing, Adjusting, and Balancing Agent: The entity responsible for performing and reporting the testing, adjusting, and balancing procedures.

I. AABC: Associated Air Balance Council.

J. AMCA: Air Movement and Control Association.

K. NEBB: National Environmental Balancing Bureau.

L. SMACNA: Sheet Metal and Air Conditioning Contractors' National Association.

1.08 COORDINATION

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist testing, adjusting, and balancing activities.

B. Notice: Provide 7 days advance notice for each test. Include scheduled test dates and times.

C. Perform testing, adjusting, and balancing after leakage and pressure tests on air distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS

A. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and controls, coordinate scheduling and testing and inspection procedures with authorities having jurisdiction.

B. Perform TAB work with doors, closed windows, and ceilings installed etc., to obtain simulated or project operating conditions. Do not proceed until systems scheduled for testing, adjusting and balancing are clean and free from debris, dirt and discarded building materials.

C. Where Owner occupies building during the testing period, cooperate with Owner to minimize conflicts with Owner's operations.

3.02 EXAMINATION

A. Examine Contract Documents to become familiar with project requirements and existing building record documents (if available) to discover conditions in systems' designs that may preclude proper testing, adjusting, and balancing of systems and equipment.
   1. Contract Documents are defined in the General and Supplementary Conditions of the Contract.
   2. Verify that balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine project record documents described in Division 01.

D. Examine equipment performance data, including fan and pump curves. Relate performance data to project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce the performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Specification Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine air-handling equipment to ensure clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine plenum ceilings, utilized for supply air, to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

K. Examine equipment for installation and for properly operating safety interlocks and controls.

L. Examine automatic temperature system components to verify the following:
   1. Dampers and other controlled devices operate by the intended controller.
   2. Dampers are in the position indicated by the controller.
   3. Integrity of dampers for free and full operation and for tightness of fully closed and fully open positions.
   4. Thermostats and humidistats are located to avoid adverse effects of sunlight, equipment, drafts, and cold walls.
   5. Sensors are located to sense only the intended conditions.
   6. Sequence of operation for control modes is according to the Contract Documents.
   7. Controller set points are set at design values. Observe and record system reactions to changes in conditions. Record default set points if different from design values.
   8. Interlocked systems are operating.
   9. Changeover from heating to cooling mode occurs according to design values.

M. Report deficiencies discovered before and during performance of testing, adjusting, and balancing procedures.

N. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Prepare a testing, adjusting, and balancing plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks and prepare system readiness reports. Verify the following:
   1. Permanent electrical power wiring is complete.
   2. Automatic temperature-control systems are operational.
   3. Equipment and duct access doors are securely closed.
   4. Balance, smoke, and fire dampers are open.
   5. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
   6. Windows, doors and other portions of the building envelope can be closed so design conditions for system operations can be met.

C. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

3.04 GENERAL TESTING AND BALANCING PROCEDURES

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC national standards or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and this Section.

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to the insulation Specifications for this Project.

C. Mark equipment settings with paint or other suitable, permanent identification material, including damper-control positions, valve indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

3.05 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 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. Adjust outlets and inlets in space to within plus or minus 10 percent of design. Outside-air and exhaust airflow rates for each room are per the Ventilation Schedule and equipment schedules on Drawing M001.

C. Adjust supply, return, and exhaust air quantities to maintain pressurization in spaces indicated in the Ventilation Schedule on Drawing M001. Note and document room-to-room pressurization and maintain these relationships. Adjust pressure controlled spaces to within plus or minus 0.01 in WC.

3.06 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. Mark on drawings locations where traverse and other critical measurements were taken and cross reference location in final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner's Representative, or Commissioning Agent.

3.07 FUNDAMENTAL AIR SYSTEMS BALANCING PROCEDURES

A. Prepare test reports for both fans and inlets and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross check the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check the airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with thermal protection, sized for the connected load.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check that condensate drains are installed, trapped and primed and routed to drain.

J. Check for readily observable leaks in air-handling unit components and ductwork.

3.08 CONSTANT-VOLUME AIR SYSTEMS BALANCING PROCEDURES

A. Adjust fans to deliver total design airflows within the maximum allowable rpm listed by the fan manufacturer. Adjust fans to deliver design airflow at the lowest possible speed.
   1. Measure fan static pressures to determine actual static pressure as follows:
      a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
      b. Measure static pressure directly at the fan outlet or through the flexible connection.
      c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
      d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
   2. Measure static pressure across each air-handling unit component under final balanced condition.
   3. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Recommend corrective action to align design and actual conditions.
   4. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.

5. Do not make fan-speed adjustments that result in motor loading greater than full load amps. Do not increase fan speed beyond fan class rating. Modulate dampers and measure fan-motor amperage to ensure no overload will occur. Measure amperage in full cooling, full heating, and economizer modes to determine the maximum required brake horsepower.
6. Adjust volume dampers for main duct, submain ducts, and major branch ducts to design airflows within specified tolerances.

3.09 ZONE DAMPER BALANCING PROCEDURES

A. Adjust each zone damper to design airflow.

3.10 TEMPERATURE-CONTROL VERIFICATION

A. Verify that controllers are calibrated and commissioned.

B. Check transmitter and controller locations and note conditions that would adversely affect control functions.

C. Record controller settings and note variances between set points and actual measurements.

D. Verify operation of limiting controllers (i.e., high- and low-temperature controllers).

E. Verify free travel and proper operation of control devices such as damper and valve operators.

F. Verify sequence of operation of control devices. Note air pressures and device positions and correlate with airflow and water-flow measurements. Note the speed of response to input changes.

G. Confirm interaction of electrically operated switch transducers.

H. Confirm interaction of interlock and lockout systems.

I. Note operation of electric actuators using spring return for proper fail-safe operations.

3.11 FINAL REPORT

A. General: Computer printout in letter-quality font, on standard bond paper, in 3-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.
   1. Include a list of the instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to the certified field report data, include the following:
   1. Fan curves.
   2. Manufacturers' test data.
   3. Field test reports prepared by system and equipment installers.
   4. Other information relative to equipment performance, but do not include approved Shop Drawings and Product Data.

D. General Report Data: In addition to the form titles and entries, include the following data in the final report, as applicable:
   1. Title page.
   2. Name and address of testing, adjusting, and balancing Agent.
   3. Project name.
   4. Project location.
   5. Architect's name and address.
   6. Engineer's name and address.
   7. Contractor's name and address.
   8. Report date.

9. Signature of testing, adjusting, and balancing Agent who certifies the report.
10. Summary of contents, including the following:
    a. Design versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
11. Nomenclature sheets for each item of equipment.
12. Data for zone dampers, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from design values.
14. Test conditions for fans and pump performance forms, including the following:
    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings, including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. System Diagrams: Include schematic layouts of air distribution systems. Present with single-line diagrams and include the following:
1. Quantities of outside, supply, return, and exhaust airflows.
2. Duct, outlet, and inlet sizes.
3. Terminal units.
4. Balancing stations.

F. Air-Handling Unit Test Reports: For packaged rooftop units, include the following:
1. Unit Data: Include the following:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches, and bore.
    i. Sheave dimensions, center-to-center and amount of adjustments in inches.
    j. Number of belts, make, and size.
    k. Number of filters, type, and size.
2. Motor Data: Include the following:
    a. Make and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches, and bore.
    f. Sheave dimensions, center-to-center and amount of adjustments in inches.
3. Test Data: Include design and actual values for the following:
    a. Total airflow rate in cfm (L/s).
    b. Total system static pressure in inches wg (Pa).
    c. Fan rpm.
    d. Discharge static pressure in inches wg (Pa).
    e. Filter static-pressure differential in inches wg (Pa).
    f. Preheat coil static-pressure differential in inches wg (Pa).
    g. Cooling coil static-pressure differential in inches wg (Pa).
    h. Heating coil static-pressure differential in inches wg (Pa).

i. Outside airflow in cfm (L/s).
j. Return airflow in cfm (L/s).
k. Outside-air damper position.
l. Return-air damper position.
m. Vortex damper position.

G. Apparatus-Coil Test Reports: For apparatus coils in all equipment with coils, include the following:
1. Coil Data: Include the following:
a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.
g. Face area in SF.
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.
2. Test Data: Include design and actual values for the following:
a. Airflow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outside-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Refrigerant suction temperature in deg F (deg C).

H. Apparatus Electric Strip Heat Test Reports: For apparatus electric strip heat, include the following:
1. Coil Data: Include the following:
a. System identification.
b. Location.
c. Make and model number.
d. Face area in SF.
e. kW capacity.
f. Voltage/phase.
2. Test Data: Include design and actual values for the following:
a. Airflow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Outside-air, wet- and dry-bulb temperatures in deg F (deg C).
d. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).

I. Fan Test Reports: For supply, return, and exhaust fans, include the following:
1. Fan Data: Include the following:
a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.

h. Sheave dimensions, center-to-center and amount of adjustments in inches.

2. Motor Data: Include the following:
   a. Make and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches, and bore.
   f. Sheave dimensions, center-to-center and amount of adjustments in inches.
   g. Number of belts, make, and size.
3. Test Data: Include design and actual values for the following:
   a. Total airflow rate in cfm (L/s).
   b. Total system static pressure in inches wg (Pa).
   c. Fan rpm.
   d. Discharge static pressure in inches wg (Pa).
   e. Suction static pressure in inches wg (Pa).

J. Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
1. Report Data: Include the following:
   a. System and air-handling unit number.
   b. Location and zone.
   c. Traverse air temperature in deg F (deg C).
   d. Duct static pressure in inches wg (Pa).
   e. Duct size in inches.
   f. Duct area in SF.
   g. Design airflow rate in cfm (L/s).
   h. Design velocity in fpm (m/s).
   i. Actual airflow rate in cfm (L/s).
   j. Actual average velocity in fpm (m/s).
   k. Barometric pressure in PSIG (Pa).

K. Air-Terminal-Device Reports: For terminal units, include the following:
1. Unit Data: Include the following:
   a. System and air-handling unit identification.
   b. Location and zone.
   c. Test apparatus used.
   d. Area served.
   e. Air-terminal-device make.
   f. Air-terminal-device number from system diagram.
   g. Air-terminal-device type and model number.
   h. Air-terminal-device size.
   i. Air-terminal-device effective area in SF.
2. Test Data: Include design and actual values for the following:
   a. Airflow rate in cfm (L/s).
   b. Air velocity in fpm (m/s).
   c. Preliminary airflow rate as needed in cfm (L/s).
   d. Preliminary velocity as needed in fpm (m/s).
   e. Final airflow rate in cfm (L/s).
   f. Final velocity in fpm (m/s).
   g. Space temperature in deg F (deg C).

L. Instrument Calibration Reports: For instrument calibration, include the following:
1. Report Data: Include the following:
   a. Instrument type and make.
   b. Serial number.

c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing testing, adjusting, and balancing, perform additional testing and balancing to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial testing, adjusting, and balancing procedures were not performed during near-peak summer and winter conditions, perform additional inspections, testing, and adjusting during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.01SUMMARY

A. Work Included: Provision of materials, installation and testing of:
   1. Type A, Flexible Fiberglass Blanket

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Piping and duct insulation products to contain less than 0.1 percent by weight PBDE in all insulating materials across the board.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:
   1. Installer qualifications.
   2. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any) for each type of product indicated.
   3. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
   4. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.
   5. Submit manufacturer's installation instructions.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Installer to have minimum 5 years experience in the business of installing insulation.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

1.07 FIRE HAZARD CLASSIFICATION

A. Maximum fire hazard classification of the composite insulation construction as installed to be not more than a flame spread of 25, fuel contributed of 50 and smoke developed of 50 as tested by current edition of ASTM E84 (NFPA 255) method.

B. Test duct insulation in accordance with current edition of ASTM E84, UL 723, NFPA 255, NFPA 90A and NFPA 90B.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Type A, Flexible Fiberglass Blanket:
   1. Certainteed
   2. Johns Manville
   3. Knauf
   4. Owens-Corning
   5. PPG
   6. Or approved equivalent.

2.02 TYPE A, FLEXIBLE FIBERGLASS BLANKET

A. ASTM C553, Type 1, Class B-2; flexible blanket.

B. 'K' Value: 0.27 BTU*in/(hr*sf*F) at 75 degrees F installed, maximum service temperature: 250 degrees F.

C. Density: 0.75 lb./cu.ft.

D. Vapor Barrier Jacket: FSK aluminum foil reinforced with fiberglass yarn and laminated to fire resistant Kraft, secured with UL listed pressure sensitive tape or outward clinched expanded staples and vapor barrier mastic as needed.

PART 3 - EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Do not apply insulation until pressure testing of the ducts and piping has been completed. Do not apply to pipe with heat tracing until system has been tested. Do not apply insulation until the duct has been inspected.

B. Examine areas and conditions under which duct insulation will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Clean and dry surfaces to be insulated.

3.03 INSTALLATION

A. Insulation: Continuous through walls, floors, partitions except where noted otherwise.

B. Ductwork:
   1. Install insulation in conformance with manufacturer's recommendations to completely cover duct.
   2. Butt insulation joints firmly together and install jackets and tapes smoothly and securely.
   3. Apply duct insulation continuously through sleeves and prepared openings, except as otherwise specified. Apply vapor barrier materials to form complete unbroken vapor seal over insulation.
   4. Coat staples and seals with vapor barrier coating.
   5. Cover breaks in jacket materials with patches of same material as vapor barrier. Extend patches not less than 2-inches beyond break or penetration on all directions and secure with adhesive and staples. Seal staples and joints with vapor barrier coating.
   6. Fill jacket penetrations. i.e., hangers, thermometers and damper operating rods, and other voids in insulation with vapor barrier coating. Seal penetration with vapor barrier coating. Insulate Hangers and Supports for cold duct in un-conditioned spaces to extent to prevent condensation on surfaces.

7. Seal and flash insulation terminations and pin punctures with reinforced vapor barrier coating.
8. Continue insulation at fire dampers and fire/smoke dampers up to and including those portions of damper frame visible at outside of the rated fire barrier. Insulating terminations at fire dampers in accordance with this section.
9. Do not conceal duct access doors with insulation. Install insulation terminations at access door in accordance with this section.
10. Duct Wrap: Cover air ducts per insulation table except ducts internally lined where internal duct lining is adequate to achieve adequate insulating values to meet local Energy Codes (indicate on shop drawings, locations where duct wrap is planned to be omitted and indicate internal duct lining insulating values to confirm they will meet the Energy Code.) Wrap tightly with circumferential joints butted and longitudinal joints overlapped minimum of 2-inches. Adhere insulation with 4-inch strips of insulating bending adhesive at 8-inches on center. On ducts over 24-inches wide, additionally secure insulation with suitable mechanical fasteners at 18-inches on center. Circumferential and longitudinal joints stapled with flare staples 6-inches on center and covered with 3-inch wide, foil reinforced tape.

3.04 PROTECTION AND REPLACEMENT

A. Installed insulation during construction. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

3.05 FIBERGLASS INSULATION

A. Lap seal insulation with waterproof adhesive. Do not use staples or other methods of attachment which would penetrate the vapor barrier. Apply fitting covers with seated tacks and vapor barrier tape.

3.06 LABELING AND MARKING

A. Provide labels, arrows and color on piping and ductwork. Attach labels and flow direction arrows to the jacketing per Section 23 05 53.

3.07 DUCTWORK SURFACES TO BE INSULATED

A. Refer to drawings.

END OF SECTION 23 07 00

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.01SUMMARY

A. Work included: Provision of materials, installation and testing of:
   1. Rectangular Ductwork Fabrication
   2. Insulated Flexible Duct
   3. Single Wall Round (and Oval) Ductwork Fabrication

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:
   1. Welding Certificates
   2. Field Quality Control Reports
   3. Record Drawings in CAD

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Welding: Qualify procedures and personnel according to AWS D1.1, Structural Welding Code - Steel for hangers and supports.
   2. NFPA Compliance:
      a. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
      b. NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
   3. Comply with NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations, Ch. 3, Duct System for range hood ducts, unless otherwise indicated.
   4. Comply with SMACNA's HVAC Duct Construction Standards - Metal and Flexible for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Provide sheet metal materials free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

1.07 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select size and type of air-moving and distribution equipment and other air system components. Duct design is generally diagrammatic and is not meant to be scaled. Major changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with

calculations showing that proposed layout will provide original design results without increasing system total pressure.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Transverse Joints:
   1. Ductmate Industries, Inc.
   2. Nexus Inc.
   3. Ward Industries, Inc.
   4. Or approved equivalent.

B. Formed-On Flanges:
   1. Ductmate Industries
   2. Lockformer
   3. Or approved equivalent.

2.02 MATERIALS

A. Galvanized Steel Ducts: Hot-dipped galvanized steel sheet, lock-forming quality, ASTM A 653/A 653M FS Type B, with G90/Z275 coating. Ducts to have mill phosphatized finish for surfaces exposed to view.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Low Emitting Materials Requirement: Adhesives, sealants and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule #1168.
   2. 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.
   3. Surface Burning Characteristics: Flame spread of zero, smoke developed of zero, when tested in accordance with ASTM E 84.
   4. Water Based Sealant for Brush-On Application: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts. Min. 69 percent solids, nonflammable. Durodyne Duroseal, Hardcast Versa-Grip 181, McGill United Duct Sealer.
   5. Solvent Based Sealant for Brush-On Application: One-part, nonsag, solvent-release-curing, polymerized butyl sealant with a minimum of 75 percent solids, nonflammable. McGill Uni-Coat, Hardcast Sure-Grip, 404.

C. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C920, Type S, Grade NS, Class 25, Use O.

D. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

E. Two-Part Tape and Adhesive System: Hardcast FTD 20/DT, McGill Air Seal Uni-Cast.

F. Silicon Sealant: Hardcast PT-302 or equal.

G. Polyurethane Sealant: General-purpose non-brittle sealant for gunned application. Vulkem 616 or equal.

2.03 RECTANGULAR DUCTWORK FABRICATION

A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
2. Deflection: Duct systems not-to-exceed deflection limits according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.

B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
1. Formed-On Flanges: construct according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible, Figure 1-4, suing corner, bolt, cleat, and gasket details.
   a. Duct Size: Maximum 30-inches wide and up to 2-inch wg pressure class.
   b. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
2. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19-inches and larger and 0.0359-inch thick or less, with more than 10 SF of nonbraced panel area unless ducts are lined.

2.04 INSULATED FLEXIBLE DUCT

A. General: Comply with OMSC latest edition, Class 1.

B. Construction: Standard factory fabricated product. Inner wall: Impervious vinyl or chlorinated polyethylene, permanently bonded to a vinyl or zinc-coated spring steel helix.

C. Insulation: Fiberglass blanket insulation covered by an outer wall of vinyl or fiberglass-reinforced metalized vapor barrier.

D. Listing: UL 181 listed Class 1 flexible air duct material. Overall thermal transmission: No more than 0.25 BTU/in or hr/sq. deg. Fat 75F differential, per ASTM C335.

E. Vapor transmission value no more than 0.10 perm, per ASTM E96

F. Pressure rating: 4-inch wg positive pressure and 1-inch wg negative pressure.

G. Performance Air friction correction factor: 1.3 maximum at 95 percent extension. Working air velocity: Minimum 2000 FPM.

H. Flame spread rating: No more than 25.

I. Smoke development rating: No more than 50 as tested per ASTM E84.

J. Insertion loss: Minimum attenuation of 29 DB for 10-foot straight length at 8-inch diameter at 500 Hz.

2.05 SINGLE WALL ROUND DUCTWORK FABRICATION

A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.

B. Round, Spiral Lock-Seam Ducts: Fabricate supply ducts of material specified in this section according to SMACNA's HVAC Duct Construction Standards - Metal and Flexible.

C. Duct Joints:
1. Ducts up to 20-inches in Diameter: Interior, center-beaded slip coupling, sealed before and after fastening, attached with sheet metal screws.
2. Round Ducts: Prefabricated connection system consisting of double-lipped, EPDM rubber gasket. Manufacture ducts according to connection system manufacturer's tolerances.
   a. Manufacturers: Lindab Inc. or approved equivalent.
3. 90-Degree Tees and laterals and Conical Tees: Fabricate to comply with SMACNA's HVAC Duct Construction Standards-Metal and Flexible, with metal thicknesses specified for longitudinal-seam straight ducts.
4. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.

5. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows to be 1.5 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
   a. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's HVAC Duct Construction Standards-Metal and flexible, unless otherwise indicated.
   b. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg (minus 500 to plus 500 Pa):
      1) Ducts 3 to 36-inches in Diameter: 0.034-inch.
      2) Ducts 37 to 50-inches in Diameter: 0.040-inch.
      3) Ducts 52 to 60-inches in Diameter5: 0.052-inch.
      4) Ducts 62 to 84-inches in diameter: 0.064-inch.
   c. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:
      1) Ducts 3 to 26-inches in Diameter: 0.034-inch.
      2) Ducts 27 to 50-inches in Diameter: 0.040-inch.
      3) Ducts 52 to 60-inches in Diameter: 0.052-inch.
      4) Ducts 62 to 84-inches in Diameter: 0.064-inch.
   d. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.
   e. Round Elbows 8-inches and Less in Diameter: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60 and 90 degrees only. Fabricate nonstandard bend-angle configurations or non-standard diameter elbows with gored construction.
   f. Round Elbows 9 through 14-inches in Diameter: Fabricate gored or pleated elbows for 30, 45, 60 and 90 degrees unless space restrictions require mitered elbows. Fabricate nonstandard bend-angle configurations or nonstandard diameter elbows with gored construction.
   g. Round Elbows Larger than 14-inches in Diameter and All Flat-Oval Elbows: Fabricate gored elbows unless space restrictions require mitered elbows.
   h. Die-Formed Elbows for Sizes through 8-inches in Diameter and Pressures 0.040-inch thick with 2-piece welded construction.
   i. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
   j. Pleated Elbows for Sizes through 14-inches in Diameter and Pressures through 10-inch wg (2500 Pa): 0.022-inch.

PART 3 - EXECUTION

3.01 DUCTWORK CONSTRUCTION

A. General: The following pressure class(es) be used in design of ductwork specified in this section unless otherwise noted on drawings:

SYSTEM	PRESSURE IP (inches of water)	CLASS METRIC
Low pressure supply (downstream of branch takeoff)	+ 1-inch	249 PA
Return main (>24-inch)	0.5-inch more negative than return/exhaust fan pressure	-498.2 PA

	or -2-inch pressure class, whichever is more negative.	
Return branch (<24-inch)	0.5-inch more negative than return/exhaust fan pressure or -2-inch pressure class, whichever is more negative.	-249 PA
General exhaust	0.5-inch more negative than return/exhaust fan pressure or -2-inch pressure class, whichever is more negative.	-498.2 PA

B. Duct Materials - Applied Locations
   1. General: Following pressure class(es) used in design of ductwork specified in this section unless otherwise noted on the drawings:
   2. Fabricate ductwork from materials as follows.
      a. Supply, Return and General Exhaust Air Ductwork and Plenums: Galvanized steel unless specified or noted otherwise.
      b. General Exhaust Branch Serving Ceiling Air Outlet in Shower Room or Toilet Room with Shower: Aluminum or T304 stainless steel.
      c. Supply, Return and General Exhaust Duct Branch to Ceiling Outlet: Flexible ductwork.
      d. Transfer Grilles Mounted in Walls: Galvanized sheet metal in wall cavity.

C. Ductwork Installation:
   1. General: Install entire duct system in accordance with drawings, Specifications, and latest issues of local Mechanical Code, NFPA 90A, and SMACNA Duct Construction Manual. At Contractor's option, rectangular ductwork may be resized to maintain an equivalent air velocity and friction rate, while maintaining a maximum aspect ratio of 3. Remove markings and tagging from ductwork exterior surface in mechanical rooms and other locations where ductwork is exposed.
   2. The duct layout shown on the Contract Drawings is diagrammatic in nature. Coordinate the ductwork routing and layout, and make alterations to the ductwork routing and layout to eliminate physical interferences. Where deviations in the ductwork routing as shown in the Contract Drawings are required, alterations may be made so as not to compromise the air flow, pressure drop, and sound characteristics of the duct fitting or duct run as shown on the Contract Drawings. In the event Architect determines that the installed ductwork is inconsistent with the above mentioned criteria, remove and replace at no additional cost to the Owner.
   3. Install round ducts in lengths not less than 12-feet (3.7 m) unless interrupted by fittings.
   4. Install ducts with fewest possible joints.
   5. Install fabricated fittings for changes in directions, size, shape, and for connections.
   6. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12-inches, with a minimum of 3 screws in each coupling.
   7. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.
   8. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
   9. Install ducts with a clearance of 1-inch, plus allowance for insulation thickness. allow for easy removal of ceiling tile.

10. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
11. Coordinate layout with suspended ceiling, air duct accessories, lighting layouts, and similar finish work.
12. Electrical and IT Equipment Spaces: route ducts to avoid passing through transformer vaults, electrical equipment spaces, IDF/MPOE rooms, and enclosures.
13. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2-inches.
14. Fire- and Smoke-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire, smoke or combination fire and smoke dampers as governed by Building Code and AHJ, including sleeves, and firestopping sealant.
15. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Reference SMACNA's Seismic Restraint manual: Guidelines for Mechanical Systems, Mason seismic restraint and support systems, details to be provided with pre-approved OPA numbers.
16. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's Duct Cleanliness for New Construction.
17. Paint interiors of metal ducts, that do not have duct liner, for 24 -inches upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible duct material.
18. Install ductwork in the location and manner shown and detailed. Review deviations required by job conditions with Architect prior to any fabrication. Provide fittings for construction per SMACNA.
19. Fabricate radius elbows with centerline radius not less than 1-1/2 duct diameters.
20. Do not install duct size transition pitch angles which exceed 30 degrees for reductions in duct size in the direction of airflow, and 15 degrees for expansions in duct size in the direction of airflow.
21. Install fixed turning vanes in square throat rectangular elbows and in tees.
22. Fabricate duct turns with the inside (smallest) radius at least equal to the duct width (supply ducts) and 1.5 times radius (return and exhaust ducts). Where necessary, square elbows may be used, with maximum available inside radius and with fixed turning vanes.

D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

E. Provide openings in ductwork where required to accommodate thermometers and control devices. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

F. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities as well as Code required clearances.

3.02 HANGING AND SUPPORTING

A. Support horizontal ducts within 24-inches of each elbow and within 48-inches of each branch intersection.

B. Support vertical ducts at maximum intervals of 16-feet (5 m) and at each floor.

C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

D. Install concrete inserts before placing concrete.

E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

F. Do not use powder-actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4-inches thick.

G. Provide aluminum supports for aluminum ductwork.

H. Provide stainless steel supports for stainless steel ductwork.

I. Floor supports in mechanical rooms to be elevated 1-inch above finish floor and void space filled with masonry grout.

J. Use double nuts and lock washers on threaded rod supports.

K. Hang rectangular sheet-metal ducts with a cross sectional area of less than 7 SF with galvanized strips of No. 16 USS gauge steel 1-inch wide, and larger ducts with steel angles and adjustable hanger rods similar to piping hangers. Support at a maximum of 8-feet on center.

L. Anchor ducts securely to building in such a manner as to prevent transmission of vibration to structure. Do not connect duct hanger straps to roof deck. Do not support ducts from other ducts, piping or equipment.

M. Attach strap hangers installed flush with end of sheet-metal duct run to duct with sheet-metal screws.

N. Construct exterior ductwork or ductwork which is otherwise exposed to weather watertight and slope 1/4-inch per foot to avoid standing water.

O. Exposed ductwork hung in clean areas such as sanitary areas, pharmaceutical areas, wash down areas or food process areas to be installed using double end, food grade trapeze hanger rods suitable for use with food grade strut.

3.03 CLEANING

A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

B. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

C. Grille and Exposed Duct Cleaning:
   1. After completion of ductwork installation, operate each fan system (excluding exhaust fans) for a minimum of 30 minutes prior to installation of ceiling grilles and diffusers. After grilles and diffusers are installed, clean out accumulation of particles from grilles and diffusers prior to acceptance.
   2. Clean exterior surface of ducts exposed to public view of chalk, pencil and pen marks, labels, sizing tags, dirt, dust, etc., so that upon completion of installation, ducts are left in clean and unblemished manufactured conditions.
   3. Exposed duct and grilles to remain free of dust entrained streaks due to leakage at joints and grille connections during warranty period. Clean leaks, seal and refinish to match existing if visible streaks develop.

3.04 FLEXIBLE DUCT

A. Install flexible duct with bend radius equal to 1.5 times the diameter. Minimum length 2-feet. Maximum length 5-feet, unless noted otherwise.
   1. Provide round neck grilles/diffusers or square-to-round transitions. Flex duct connections directly to square neck not allowed.
   2. Flex duct allowed in concealed spaces above lay-in ceilings only.\

3.05 SPIN-IN FITTINGS AND FLANGED TAKE-OFFS

A. Install at branch takeoffs to outlets using round or flex duct.

B. Flanged take-offs secured with minimum 8-inch screw spacing (3 screws minimum).

C. All ductwork taps and branches off of main ducts are to be at forty-five (45) degrees whether shown on drawings or not (drawings are diagrammatic).

3.06 LOUVER BLANK-OFF PANELS

A. Install blank-off panels on unused portions of louvers.

3.07 MOUNTING FOR SIDEWALL GRILLES AND REGISTERS

A. Mounting heights indicated on Drawings from finish floor to lower edge of grille or register. Exception: If mounting height is not shown on drawings, use "Down 6-inches". This indicates measurement from ceiling to top edge of grille or register.

B. Install sidewall return air grilles for "sight-tight" visibility at eye level (position blades to obscure visibility from floor level).

END OF SECTION 23 31 00

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.01SUMMARY

A. Work included: Provision of materials, installation and testing of:
   1. Sheet Metal Materials
   2. Backdraft Dampers
   3. Dampers
   4. Access Doors
   5. Duct Test Holes
   6. Dynamic Fire Dampers
   7. Control Dampers
   8. Turning Vanes
   9. Flexible Connectors

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this Section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:
   1. Manufacturer's catalog data and fabrication/installation drawings for each factory fabricated duct accessory. Include leakage, pressure drop and maximum back pressure data.
   2. Shop Drawings: Indicate air duct accessories.
   3. Manufacturer's installation instructions: Provide instructions for each factory fabricated duct accessory.
   4. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
      a. See Section Division 01 Product Requirements, for additional provisions.
      b. Extra Fusible Links: One of each type and size.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
   2. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
   3. AMCA 500 - Test Methods for Louvers, Dampers and Shutters.
   4. AMCA 511 - Certified Ratings Program for Air Control Devices.
   5. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
   6. NFPA 101 - Life Safety Code.
   7. UL 555 - Standard for Safety; Fire Dampers.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Backdraft Dampers:
   1. Ruskin CB D6
   2. Greenheck
   3. Nailor
   4. Or approved equivalent.

B. Dampers:
   1. Ruskin
   2. Greenheck
   3. Nailor
   4. Or approved equivalent.

C. Access Doors:
   1. Ductmate
   2. Ruskin
   3. Nailor
   4. Or approved equivalent.

D. Dynamic Fire Dampers:
   1. Ruskin
   2. Greenheck
   3. Nailor
   4. Or approved equivalent.

E. Control Dampers:
   1. Prolon.
   2. Or approved equivalent.

F. Turning Vanes:
   1. Aerodyne
   2. Ductmate Industries
   3. Duro Dyne Corp
   4. Metalaire Inc.
   5. Ward Industries
   6. Or approved equivalent.

G. Flexible Connectors:
   1. Duro Dyne Corp.
   2. Ventfabrics Inc.
   3. Ward Industries
   4. Or approved equivalent.

2.02 SHEET METAL MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M. Galvanizing: 1-1/4 ounces per square foot total both sides; ducts to have mill-phosphatized finish for surfaces exposed to view.

C. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36-inches or less; 3/8-inch minimum diameter for lengths longer than 36-inches.

2.03 BACKDRAFT DAMPERS

A. Basis-of-Design: Ruskin CB D6.

B. Description: Multiple-blade gravity balanced with center pivoted blades with sealed edges, assembled in rattle free manner with 90-degree stop, adjustment device to permit setting for varying differential static pressure.

C. Frame: 0.125-inch thick 6063-T5 extruded aluminum channel with galvanized steel braces at mitered corners. Provide mounting flange.

D. Blades: Single piece, overlap frame, parallel action, horizontal orientation, minimum.070-inch 6063-T5 extruded aluminum material, maximum 6-inch width.

E. Bearings: Corrosion-resistant synthetic, formed as single piece with axles.

F. Blade Seals: Extruded vinyl, mechanically attached to blade edge.

G. Blade Axles: Corrosion-resistant, synthetic formed as single piece with bearings, locked to blade.

H. Tie Bars and Brackets: Galvanized steel.

I. Return Spring: Adjustable tension.

J. Damper Capacity:
   1. Closed Position: Maximum back pressure of 16-inches water gauge.
   2. Open Position: Maximum air velocity of 2,500-feet per minute.

K. Counterbalances: Adjustable zinc plated steel weights mechanically attached to blade. Must be capable of operating over wide range of pressures.

L. Finish: Mill aluminum.

M. Temperature Rating: -40 degrees F to 200 degrees F.

N. Operation of Blade:
   1. Start to Open: 0.01-inch wg
   2. Fully Open: 0.05-inch.

O. Pressure Drop: Maximum 0.15-inch wg at 1,500-feet per minute through 24-inch by 24-inch damper.

P. Factory Sleeve: Minimum 20 gauge thickness, 12-inches in length.

Q. Screen: At outdoor intake or discharge. 1/4-inch aluminum.

2.04 DAMPERS

A. Basis-of-Design: Ruskin MD35 (rectangular).

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.
   1. Pressure Classes of 3-Inch wg (750 Pa) or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Rectangular Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design with linkage concealed in frame and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum 16 gauge thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
    a. Roll-Formed Steel Blades: 16 gauge thick, galvanized sheet steel.
    b. Aluminum Frames: Hat-shaped, 10 gauge thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
    c. Roll-Formed Aluminum Blades: 10 gauge thick aluminum sheet.
    d. Extruded-Aluminum Blades: 16 gauge thick extruded aluminum.
    e. Blade Axles: Minimum 1/2-inch diameter, plated steel, hex shaped, mechanically attached to blade.
    f. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.
    g. Tie Bars and Brackets: Galvanized steel.
    h. Mill galvanized.
    i. Capacity:
        1) Closed Position: Maximum pressure of 3-inches wg
        2) Open Position: Maximum air velocity of 1,500-feet per minute across 24-inch by 24-inch damper.

D. Round Volume Dampers: Single-blade suitable for horizontal or vertical applications.
1. Steel Frames: Galvanized, roll formed, minimum of 20 gauge thick with beads at each end.
2. Blades: Minimum 20 gauge thick, galvanized sheet steel, round, single-piece.
3. Aluminum Frames: Minimum 10 gauge thick aluminum sheet.
4. Aluminum Blades: Minimum 10 gauge thick aluminum sheet.
5. Extruded-Aluminum Blades: Minimum 16 gauge thick extruded aluminum.
6. Blade Axles: Minimum 3/8-inch square, plated steel, mechanically attached to blade.
7. Bearings: Molded synthetic sleeve, turning in hole in frame.
8. Finish: Mill galvanized.
9. Capacity:
    a. Closed Position: Maximum pressure of 3-inches wg
    b. Open Position: Maximum air velocity of 1,500-feet per minute.
10. Leakage: Maximum 40 cfm at 1-inch wg for 20-inches diameter damper.
11. Pressure Drop: Maximum 0.02-inch wg at 1,500-feet per minute through 20-inch diameter dampers.

E. Jackshaft: 1-inch diameter, galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
1. Length and Number of Mountings: Appropriate to connect linkage of each damper in multiple-damper assembly.
2. Damper Hardware: Zinc-plated, die-cast core with dial and handle made of 3/32-inch thick zinc-plated steel, and a 3/4-inch hexagon locking nut. Include center hole to suit damper operating-rod size. Include 2” elevated platform for insulated duct mounting.

F. Concealed Damper Hardware: For dampers above non-removable ceilings (gyp, plaster, decorative, etc.) where access panels have not been shown on Architectural drawings or in locations where dampers are more than 2-feet above the ceiling, provide:
1. Concealed Damper Regulator: Young Regulator Company Model 315 or approved equivalent.
2. Cable System: Young Regulator Company or approved equivalent.
3. Controller: Young Regulator Company 270-275 or approved equivalent.
4. Control wrenches, wire stops, casing nuts, and stainless steel wire.
5. Paint cover plate to match ceiling color or as directed by Architect.

2.05 ACCESS DOORS

A. Duct Pressure Class 2-inch WC and Greater: Sandwich-type design with threaded locking bolt assembly. Closed cell neoprene gasket permanently bonded to inside panel. Zinc-coated steel wing nuts or polypropylene molded knobs with threaded metal inserts - zinc coated bolts sealed to inner panel.

B. Duct Pressure Class 1-½-inch WC and Less: Galvanized steel assembly incorporating frame, door, hinges, and latch(es). Frame tabbed for attachment to duct panel. Double wall door panel with 1-inch insulation. Open cell neoprene gasket attached to frame. Cam latches for tight closure.

C. Plenum Doors: Extruded aluminum frames with extruded santoprene seals. Double-wall 20 gauge galvanized steel door panel with fiberglass insulation.

D. Size: Maximum size available to fit rectangular duct panel dimension or round duct diameter. Plenum doors minimum 2-feet wide x 4-feet high.

2.06 DUCT TEST HOLES

A. Temporary Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.07 DYNAMIC FIRE DAMPERS

A. Basis-of-Design: Ruskin Model DIBD23 (3-hour rated).

B. Ratings:
   1. Fire Resistance: UL 555 classified and provide fire dampers with UL label for fire rating as appropriate for wall rating and in conformance with NFPA 90A.
   2. Dynamic Closure Rating: Dampers classified for dynamic closure to 2000-feet per minute and 4-inches wg (1 kPa) static pressure.

C. Construction:
   1. Frame: Roll formed, galvanized steel channel.
   2. Sleeves: Damper to be supplied as a single assembly with an integral factory sleeve.
   3. Retaining Angles: Damper to be supplied with factory retaining angles sized to provide installation overlap in accordance with manufacturer's UL listing.
   4. Blades: Galvanized curtain type.
   5. Closure Springs: Type 301 stainless steel, constant force or spring clip type.
   6. Temperature Release Device: 165 degrees F.
   7. Mounting: Vertical or Horizontal.
   8. Finish: Mill galvanized.

D. Indicator Switches: Provide remote indication of damper blade position. One per section required.

E. Factory mounting angles and breakaway connections

F. Factory Tests: Factory cycle damper to assure proper operation.

2.08 CONTROL DAMPERS

A. Basis-of-Design: Prolon PL-AV Series motorized zone/control dampers (ZD-1, ZD-2, ZD-3).

B. Fabrication:
   1. Frame: 16 gauge roll formed, galvanized steel hat-shaped channel, reinforced at corners. Structurally equivalent to 13 gauge U-channel.

2. Blades:
    a. Style: Single skin with 3 longitudinal grooves.
    b. Action: Opposed blade for modulating applications, parallel blade for two position application..
    c. Orientation: Horizontal or vertical with thrust washers.
    d. Material: Minimum 16 gauge equivalent thickness, galvanized steel.
    e. Width: Nominal 6-inches.
3. Bearings: Molded synthetic sleeve, turning in extruded hole in frame.
4. Seals:
    a. Blade: Inflatable PVC coated fiberglass material and galvanized steel. Mechanically attached to blade edge.
    b. Jamb: Flexible metal compression type.
5. Linkage: Concealed in frame.
6. Axles: Minimum 1/2-inch diameter plated steel, hex-shaped, mechanically attached to blade.
7. Mounting: Vertical or horizontal.
8. Finish: Mill galvanized for installation in galvanized sheetmetal and stainless steel for installation in stainless steel ductwork.

C. Performance Data (low leakage dampers):
1. Capacity: Demonstrate capacity of damper to withstand HVAC system operating conditions.
    a. Closed Position: Maximum pressure of 5-inches wg (1.2 kPa) at a 12-inch (305) blade length.
    b. Open Position: Maximum air velocity of 2,000-feet per minute (610 m/min).
2. Leakage: Maximum 3.7 cubic-feet per minute per square foot (1.1 m3/min/m2) at 1-inch wg (0.25 kPa) for sizes 36-inches wide and above.
3. Pressure Drop: Maximum 0.07-inch wg (0.02 kPa) at 1,500-feet per minute (457 m/min) across 24-inch x 24-inch damper.

D. Actuator: See specification Section 23 09 00 Instrumentation and Control for HVAC

E. Factory Flange Frame

F. Factory Sleeve: Minimum 20 gauge thickness.

G. Duct Transition Connection: Round, Oval, or Rectangular.

H. Factory Tests: Factory cycle damper assembly to assure proper operation.

2.09 TURNING VANES

A. Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for vanes and vane runners. Vane runners to automatically align vanes.

B. Manufactured Turning Vanes: For medium pressure ductwork, ductwork upstream of terminal units, and in ductwork with equal inlet width and height dimensions and outlet width and height dimension, provide double thickness airfoil turning vanes. Low pressure ductwork and ductwork downstream of terminal units use either single thickness or double thickness turning vanes. For mitered rectangular elbows with changes in size from inlet to outlet, only use single thickness turning vanes. Use 4-inch radius vanes spaced on centers of 3.25-inches for single thickness. Use 4-inch radius vanes spaced on centers of 3.5-inches for double thickness.

2.10 FLEXIBLE CONNECTORS

A. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

B. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2-inches wide attached to two strips of 2-3/4-inch wide, 0.028-inch thick, galvanized sheet steel or 0.032-inch thick aluminum sheets. Select metal compatible with ducts.

C. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
   2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
   3. Service Temperature: Minus 40 to plus 200 degrees F (Minus 40 to plus 93 degrees C).

PART 3 - EXECUTION

3.01 PREPARATION

A. Verify that electric power is available and of correct characteristics.

B. Inspect areas to receive air duct accessories. Notify Engineer of conditions that would adversely affect the installation of the dampers. Do not proceed until conditions are corrected.

C. Coordinate location in RCP and color of concealed damper hardware with Architects prior to installation.

3.02 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Where installing volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts for air balancing. Install at a minimum of two duct widths from each branch takeoff. Provide balancing dampers for all air inlets and outlets.

F. Provide test holes at fan inlets and outlets and where required for air testing and balancing.

G. Install fire dampers, with fusible links, and in accordance with manufacturer's UL-approved written instructions.

H. Install all dampers square and free from racking with blade running horizontally.

I. Do not compress or stretch damper frames into duct or opening.

J. Handle dampers using sleeve or frame. Do not lift dampers using blades, actuators, or jack shafts.

K. Install bracing for multiple sections to support assembly weights and hold against system pressure. Install bracing as needed.

L. Turning Vanes:
   1. Vanes must be installed in all square elbows, eliminating every other vane is not allowed.
   2. Single thickness vanes cannot be over 36-inches long without intermediate vane runner.
   3. Install per SMACNA and fasten/support to prevent vibration, noise, and to maintain proper alignment at design velocity

M. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:
   1. On both sides of duct coils.
   2. Downstream from volume dampers and equipment.

3. Adjacent to fire dampers, providing access to reset or reinstall fusible links.
4. To interior of ducts for cleaning; before and after each change in direction, at maximum 50-foot (15-m) spacing.
5. Install the following sizes for duct-mounting, rectangular access doors:
   a. One-Hand or Inspection Access: 8-inches by 5-inches.
   b. Two-Hand Access: 12-inches by 6-inches.
   c. Head and Hand Access: 18-inches by 10-inches.
   d. Head and Shoulders Access: 21-inches by 14-inches.
   e. Body Access: 25-inches by 14-inches.
   f. Body Plus Ladder Access: 25-inches by 17-inches.
6. Install the following sizes for duct-mounting, round access doors:
   a. One-Hand or Inspection Access: 8-inches in diameter.
   b. Two-Hand Access: 10-inches in diameter.
   c. Head and Hand Access: 12-inches in diameter.
   d. Head and Shoulders Access: 18-inches in diameter.
   e. Body Access: 24-inches in diameter.
7. Label access doors.

N. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and rooftop units (RTU-1 through RTU-5, EF-1, EF-2) supported by vibration isolators. Provide sheet metal weather cover over flexible connections located outdoors. Attach sheet metal to either equipment side or ductwork side, but not both.

O. For fans developing static pressures of 5-inch wg (1250 Pa) and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

P. Install duct test holes where indicated and required for testing and balancing purposes.

3.03 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire dampers for proper action.

END OF SECTION 23 33 00

SECTION 233400
HVAC FANS

PART 1 - GENERAL

1.01SUMMARY

A. Provide ceiling-mounted exhaust fans EF-1 and EF-2.

B. Refer to Schedule at end of this Section.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

B. Shop Drawings: Submit shop drawings indicating material characteristics, details of construction, connections, and relationship with adjacent construction.

1.03 QUALITY ASSURANCE

A. Provide ceiling exhaust fans and roof and wall exhausters/ventilators bearing industry Certified Ratings Seal in accordance with AMCA 210.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bearing AMCA Certified Sound Rating Seal.

C. Fabrication: Conform to AMCA 99.

D. Provide fans which have been Underwriters Laboratories Inc. (UL) listed and labeled.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Ceiling-Mounted Exhaust Fan (EF-1, EF-2) Manufacturer: Greenheck Fan Corp., SP-A series (basis of design); or approved equal.

2.02 GENERAL

A. Provide fans that have been factory assembled, wired and tested.

B. Provide fans in compliance with the performance and electrical requirements specified in Schedule at the end of this Section.

C. Fan Performance: Based on sea level conditions.

D. Statically and dynamically balance fans to eliminate vibration or noise transmission to occupied areas of the building.

E. Provide safety screen and guards.

2.03 CEILING-MOUNTED EXHAUST FANS (EF-1, EF-2)

A. Type: Centrifugal fan, direct driven.

B. Housing: Galvanized steel lined with acoustical insulation, specifically designed and manufactured for ceiling installation; integral backdraft damper fan discharge; removable inlet grille.

C. Fan: Forward curved centrifugal wheel mounted on motor shaft with fan shrouds.

D. Motor: Permanent split-capacitor, permanently lubricated; grounded, overload protected and vibration isolated.

E. Electrical: Junction box for electrical connection on housing; receptacle for motor plug-in.

F. Roof Cap (EF-1): Roof-mounted, prefabricated, with rainproof cap and birdscreen; backdraft damper at fan discharge.

G. Wall Cap (EF-2): Wall-mounted, prefabricated, with rainproof cap and birdscreen, located minimum 3 feet from any operable opening; backdraft damper at fan discharge.

H. Electrical: 120 Volts, single phase, 60 Hz.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install metal fabrication items plumb and level, accurately fitted and aligned and free from distortion or defects.

3.02 FAN SCHEDULE

A. Refer to drawings.

END OF SECTION 23 34 00

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: Provision of materials, installation and testing of:
   1. Grilles, Registers, Diffusers

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:
   1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
   2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
   3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size and accessories furnished.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. Air distribution Diffuser, Register, and Grille Schedule lists basis-of-design, with any specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of basis-of-design:
      a. Construction materials and appearance.
      b. Frame/installation method.
      c. Isothermal throw plus or minus 5 percent at design flows shown on drawings.
      d. Noise Criteria: NC value plus or minus 1 at design flows shown on drawings.
      e. Accessories: Equal to Basis-of-Design.

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers as specified in specific articles below.

2.02 GRILLES, REGISTERS, DIFFUSERS

A. Diffuser, Register and Grille Schedule lists basis-of-design, with specialty accessories, construction, finish or other criteria noted on schedule. Submitted air distribution must match criteria of basis-of-design, including accessories and finish:
   1. Matching construction materials and appearance. Equal installation method/frame.
   2. Pressure drop equal to or less than basis-of-design at CFM on plans.
   3. Throw: Isothermal jet throw plus or minus 5 percent of basis-of-design at CFM listed on plans.
   4. Noise Criteria: Plus or minus 1 NC of basis-of-design at CFM listed on plans. If basis-of-design NC is below registered level, submitted must match. NC rating with 10 dB room factor or less.

B. Provide 1-, 2-, 3-, or 4-way deflection as indicated on plans.

C. Register Dampers: Dampers utilized with grilles. Opposed blade dampers utilizing a side operated worm drive which provides external duct operation. Slot the end of the shaft to receive a screwdriver. Factory assembled side operator. Construct of the same material as the grille. Manufacturer same as grilles/diffuser.

D. Coordinate mounting frames with ceiling construction type. Verify per reflected ceiling plans.

E. Manufacturer: Titus, Types A through E per the Air Device Schedule on Drawing M001, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions. Provide seismic supports, clips, and bracing per local code. Coordinate installation of framing. Provide complete coverage of rough openings by integral device flanges or auxiliary frames. Where above ceiling location is unconditioned space, caulk rough openings; repair and re-paint locations where dust entrainment streaks develop due to unsealed openings.

B. Damp locations, such as lockers, restrooms, showers, natatoriums, whirlpool/spas, to have aluminum construction even if scheduled otherwise; mounting hardware to be stainless steel.

C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement. Coordinate with architectural reflected ceiling plan(s); Reflected ceiling plans determine final locations.

D. Install diffusers to ductwork with air tight connection. 18-inch straight duct section or acoustic plenum at connection. Provide square to round adapters where required for connection to round ducts.

E. Provide integral balancing dampers for diffusers, and grilles and registers where duct manual balancing dampers are not shown or specified.

F. Adjust discharge direction and spread per plans. Adjust throws of air outlets to eliminate drafts and to distribute air during heating and cooling operation.

G. Exterior color of grilles per Architect. White finish if not otherwise scheduled or noted by Architect. Paint ductwork visible behind air outlets and inlets matte black.

H. Ceiling membrane: Protect ceiling membrane per code. Fire caulk around openings. Provide listed radiation damper in rated roof/ceiling or floor/ceiling assemblies as required per code.

3.02 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

END OF SECTION 23 37 00

SECTION 23 74 00
ROOFTOP PACKAGED AIR CONDITIONING UNITS

PART 1 - GENERAL

1.01SUMMARY

A. Work Included: Materials, installation and testing of roof-mounted, packaged direct expansion air conditioning units in the following configuration:
   1. Rooftop Packaged Air Conditioning Units, Constant Volume (up to 20 tons).

1.02 RELATED SECTIONS

A. Contents of Division 23 and Division 01, General Requirements apply to this section.

1.03 REFERENCES AND STANDARDS

A. References and Standards as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following:
   1. ARI 410 - Standard for Forced Circulation Air-Heating and Air-Cooling Coils.

1.04 SUBMITTALS

A. Submittals as required by Section 23 00 00 and Division 01, General Requirements.

1.05 QUALITY ASSURANCE

A. Quality assurance as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, meet the following
   1. Interior surfaces of units to meet erosion and growth resistance requirements as well as construction requirements for equipment of ASHRAE 62.1, latest edition.
   2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   3. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Code for Mechanical Refrigeration."
   4. Energy-Efficiency Ratio: Meet minimum requirements shown on drawings.
   5. Coefficient of Performance: Meet minimum requirements shown on drawings.
   6. Classified in accordance with ANSI Z 21.47.
   7. ARI Certification: Provide ARI certified and listed units.
   8. ARI Compliance for Units with Capacities Less Than 135,000 Btuh (39.6 kW): Rate rooftop air-conditioner capacity according to ARI 210/240, "Unitary Air-Conditioning and Air-Source Heat Pump Equipment."
   9. ARI Compliance for Units with Capacities 135,000 Btuh (39.6 kW) and More: Rate rooftop air-conditioner capacity according to ARI 340/360, "Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment."
   10. Sound Power Level Ratings: Comply with ARI 270, "Sound Rating of Outdoor Unitary Equipment."

1.06 WARRANTY

A. Warranty of materials and workmanship as required by Section 23 00 00 and Division 01, General Requirements.

B. In addition, provide:

1. Provide total 5 years manufacturer's warranty for compressor(s), including parts and labor.
2. Provide 5 year manufacturer warranty on heat exchanger.

1.07 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fan Belts: one set for each belt-drive fan.
   2. Filters: one set of filters for each unit.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Rooftop Package Air Conditioning Units, Constant Volume (up to 20 tons):
   1. Trane
   2. Daikin
   3. York
   4. Or approved equivalent.

2.02 ROOFTOP PACKAGE AIR CONDITIONING UNITS, CONSTANT VOLUME (UP TO 20 TONS)

A. Description: Factory assembled and tested; designed for outdoor installation; consisting of compressor, indoor and outside refrigerant coils, indoor fan and outside coil fan, refrigeration and temperature controls, electric strip heat, filters, dampers and other accessories/devices listed in this specification and the drawings.

B. Casing: Galvanized steel construction with enamel paint finish, removable panels or access doors with neoprene gaskets for inspection and access to internal parts, minimum 3/4-inch thick thermal insulation, knockouts for electrical and piping connections, exterior condensate drain connection, and lifting lugs. Single wall or Double wall Construction. Finished panel surfaces to withstand a minimum 1000-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance. Unit base to overhang the roof curb for positive water runoff and to seat on the roof curb gasket to provide a positive weather tight seal.

C. Indoor Fan: Double width, double inlet (DWDI) forward curved, centrifugal belt driven by single-speed motor.
   1. Fan assembly to have adjustable pitched sheaves on the motor. Bushings to be used on sheaves to allow for easy removal of the pulleys from the fan and motor shaft. Fixed bore pulleys fastened to the shaft by setscrews will not be allowed. Drives selected with a 1.2 service factor.
   2. Fan assemblies statically and dynamically balanced at the factory, including a final trim balance, prior to shipment. Fan assemblies to employ solid steel fan shafts. Bearings sized to provide a L-50 life of 250,000 hours.
   3. Provide fan motors heavy-duty, 1800 rpm, open drip-proof (ODP). Motors efficiencies to meet EPAct premium efficiencies. Motors mounted on an adjustable base that provides for proper alignment and belt tension adjustment.
   4. Fan design to allow for the fan and motor assembly to slide out of the rooftop unit for ease of servicing the equipment.

D. Outside Coil Fan: Condenser fans to be direct drive, axial type designed for low tip speed and vertical air discharge. Condenser fan rpm to be 1140 rpm maximum. Fan blades constructed of steel and riveted to a steel center hub. Condenser fan motors to be heavy-duty, non reversing type with permanently lubricated ball bearing and thermal protection. Motor design to be totally enclosed air over (TEAO).

E. Refrigerant Coils: Aluminum or Copper fin and seamless copper tube in steel casing with equalizing-type vertical distributor. Coils factory leak tested with high pressure air under water. Provide condenser coils protected from incidental contact to coil fins by a coil guard.

F. Compressor: Hermetic scroll compressor with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief, and crankcase heater. Digital Scroll compressor capable of 10:1 turndown.

G. Refrigeration System:
   1. Compressor with an automatic-reset control that shuts compressor off after five minutes.
   2. Outside coil and fan.
   3. Indoor coil and fan.
   4. Four-way reversing valve and suction line accumulator.
   5. Thermal expansion valve with replaceable thermostatic element and liquid line filter drier.
   6. Refrigerant dryer.
   7. High-pressure switch.
   8. Low-pressure switch.
   9. Thermostat for coil freeze-up protection during low-ambient temperature operation or loss of air.
   10. Low-ambient switch.
   11. Brass service valves installed in discharge and liquid lines.
   12. Refrigerant gauge parts.
   13. Charge of low GWP refrigerant (R-454B or R-32) and oil.
   14. Independent refrigerant circuits where unit has multiple compressors.

H. Drain Pan: Stainless steel, positively sloped drain pan provided with the cooling coil. Drain pan to extend beyond the leaving side of the coil and underneath the cooling coil connections. Drain pan to have a minimum slope of 1/8-inch per foot to provide positive draining. The slope of the drain pan to be in two directions and comply with ASHRAE Standard 62.1. Drain pan to be connected to a threaded drain connection extending through the unit base.

I. Electric Strip Heat: to be provided by the manufacturer and factory installed with a single point of connection, powered internally by the unit.

J. Filters: 2-inch thick throwaway filters in filter rack. Filters similar to Farr 30/30.

K. Power Connection: Provide for single connection of power to unit with control-circuit transformer with built-in circuit breaker.

L. Electrical: Unit wiring to comply with NEC requirements and with applicable UL standards. Electrical components to be UL recognized where applicable. Wiring and electrical components provided with the unit to be number and color coded and labeled according to the electrical diagram provided for easy identification. The unit to be provided with a factory wired weatherproof control panel. Unit to have a single point power connection for main power connection. A terminal board to be provided for low voltage control wiring. Each compressor and condenser fan motor to be furnished with contactors and thermal overload protection. Supply fan motors to have a factory installed and wired control contactor. Knockouts to be provided in the bottom of the main control panels for field wiring entrance.

M. Unit Controls: Solid-state control board and components contain at least the following features:
   1. Indoor fan on/off delay.
   2. Default control to ensure proper operation after power interruption.
   3. Service relay output.
   4. Unit diagnostics and diagnostic code storage.
   5. Field-adjustable control parameters.
   6. Defrost control.
   7. Dehumidification control with dehumidistat.
   8. Electric heat staging.
   9. Low-ambient control, allowing operation down to 0 degrees F (minus 18 deg C).
   10. Minimum run time.
   11. Night setback mode.
   12. Return-air temperature limit.

13. Smoke alarm with smoke detector installed in return air.
14. Low-refrigerant pressure control.
15. Digital display of outside temperature, supply-air temperature, return-air temperature, outside air damper position, indoor-air quality, and control parameters.

N. Electromechanical Thermostat: Staged heating and cooling on subbase with manual system switch (on-heat-auto-cool) and fan switch (auto-on).
1. Night setback operation with single-stage heating control with seven-day time clock with battery backup.
2. Fan-proving switch to lock out unit if fan fails.
3. Dirty-filter switch.

O. Accessories:
1. Cold-Weather Kit: Electric heater maintains temperature in heat pump coil
2. Service Outlets: Two, 115-V, ground-fault, circuit-interrupter type.
3. Condensate drain trap.
4. Dirty-filter switch.
5. Hail guards of steel, painted to match casing with matching corrosion protection.
6. Power Exhaust Fan: Centrifugal type. Direct drive with variable frequency drive.

P. Roof Curb:
1. 14 gauge galvanized steel with corrosion-protection coating, gasketing, and factory-installed wood nailer; complying with NRCA standards; minimum height of 14-inches.
2. Insulate interior of the curb with 2-inches of 1.5 pound neoprene coated fiberglass insulation.
3. Provide seismic restraints to secure the unit to the curb in accordance with Code.

PART 3 - EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Roof curb to be mounted level on roof in accordance to NRCA manuals and details. Secure to structure per engineered/sealed seismic installation details.

B. Unit to be secured to curb per seismic installation details.

C. Seal openings between curb, roof opening, ducts, electrical conduits, piping, and building interior.

D. Protect the roof from damage during installation. Secure factory touch-up paint to repair scratches and minor damage to equipment prior to Start-up. Comb evaporator and condenser coils to repair any minor fin damage.

E. Locate rooftop unit outdoor-air intakes a minimum of 10 feet from any exhaust fan termination (EF-1, EF-2), and coordinate that exhaust terminations maintain a minimum of 10 feet from any RTU outdoor-air intake, per roof plan keynotes on Drawing M100.

F. Control wiring from roof-mounted equipment must be routed in conduit from above roof to inside building or must be routed through roof curb inside unit. Control wiring must not be exposed to weather.

3.03 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
   1. Install ducts to termination in roof curb.
   2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
   3. Terminate return-air duct through roof structure.
   4. Fill void between roof and bottom of unit with 3-pound density acoustic batt.

C. Electrical System Connections: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.

D. Ground equipment according to Division 26.

E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.04 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections[, and to assist in field testing]. Report results in writing.

B. Perform the following field quality-control tests and inspections and prepare test reports:
   1. After installing rooftop air conditioners and after electrical circuitry has been energized, test units for compliance with requirements.
   2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
   3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
   4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove malfunctioning units, replace with new units, and retest as specified above.

3.05 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
   1. Inspect for visible damage to unit casing.
   2. Inspect for visible damage to furnace combustion chamber.
   3. Inspect for visible damage to compressor, air-cooled outside coil, internal coils, and fans.
   4. Inspect internal insulation.
   5. Verify that labels are clearly visible.
   6. Verify that clearances have been provided for servicing.
   7. Verify that controls are connected and operable.
   8. Verify that filters are installed.
   9. Clean outside coil and inspect for construction debris.
   10. Clean furnace flue and inspect for construction debris.
   11. Adjust vibration isolators.
   12. Inspect operation of barometric dampers.
   13. Lubricate bearings on fan.
   14. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
   15. Adjust fan belts to proper alignment and tension.
   16. Start unit according to manufacturer's written instructions.
      a. Coordinate starting of refrigeration system during winter with manufacturer.

b. Complete startup sheets and attach copy with Contractor's startup report.

17. Inspect and record performance of interlocks and protective devices; verify sequences.
18. Operate unit for an initial period as recommended or required by manufacturer.
19. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency. Adjust pilot to stable flame.
    a. Measure combustion-air temperature at inlet to combustion chamber.
    b. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
20. Calibrate thermostats.
21. Adjust and inspect high-temperature limits.
22. Inspect outside-air dampers for proper stroke and interlock with return-air dampers.
23. Start refrigeration system and measure and record the following:
    a. Coil leaving-air, dry- and wet-bulb temperatures.
    b. Coil entering-air, dry- and wet-bulb temperatures.
    c. Outside-air, dry-bulb temperature.
    d. Outside-air-coil, discharge-air, dry-bulb temperature.
24. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
25. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
    a. Supply-air volume.
    b. Return-air volume.
    c. Relief-air volume.
    d. Outside-air intake volume.
26. Simulate maximum cooling demand and inspect the following:
    a. Compressor refrigerant suction and hot-gas pressures.
    b. Short circuiting of air through outside coil or from outside coil to outside-air intake.
27. Verify operation of remote panel, including pilot-light operation and failure modes. Inspect the following:
    a. High-limit heat exchanger.
    b. Warm-up for morning cycle.
    c. Freezestat operation.
    d. Alarms.
28. After startup and performance testing, change filters, vacuum heat exchanger and cooling and outside coils, lubricate bearings, adjust belt tension, and inspect operation of power vents.

3.06 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

B. Occupancy Adjustments: Within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose, without additional cost.

3.07 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain rooftop air conditioners. Reference Division 01.

END OF SECTION 23 74 00

SECTION 26 01 00
GENERAL PROVISIONS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Switchboards.

B. Secondary power wiring and distribution system.

C. Emergency power generation system.

D. Fire alarm and smoke detection system.

E. Low-Voltage system rough-in.

F. Lighting control equipment.

G. Electrical control systems and interlock wiring.

1.02 RELATED WORK

A. Foundations and pads required for equipment furnished under this division of the specifications.

B. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting.

C. Electrical control systems and interlock wiring as required by mechanical drawings, specifications or manufacturer's schematics.

D. Flashing of conduits into roofing and outside walls.

E. Heating, ventilating, and air conditioning equipment.

F. Plumbing equipment.

G. Fuel oil storage tank and fuel transfer pumping system.

H. Kitchen equipment.

1.03 QUALITY ASSURANCE

A. Comply with applicable local, state and federal codes.

B. Comply with applicable requirements of recognized industry associations which promulgate standards for the various trades.

C. Employ only qualified journeymen for this work. Employ a competent qualified electrician to supervise the work.

1.04 STANDARDS

A. Perform work specified in Division 26 in accordance with standards listed below including amendments or revisions. When these specifications are more stringent, they take precedence. In case of conflict, obtain a decision from the Designer.

B. National Fire Codes (NFPA) including, but not limited to following:
   1. NFPA-70 - National Electrical Code. 2023 Edition.
   2. NFPA-72 - National Fire Alarm Code. Latest Edition.
   3. NFPA-101 - Life Safety Code. Latest Edition.
   4. NFPA-110 - Power Systems, Emergency and Standby. Latest Edition.

C. Should any work be construed as being contrary to or not conforming to aforementioned codes, such alleged confliction to be brought to attention of Engineer in writing ten (10) days prior to bid date for review so that such point in question may be resolved. All work to be installed in strict conformity with applicable codes without additional cost to Owner.

D. Contractor to submit and/or file with proper authorities all necessary specifications and drawings as required by governing authorities.

1.05 SUBMITTALS

A. Submit individual submittals for each item or piece of equipment. Assign a separate submittal number and transmittal to each item. Do NOT group items or equipment together in one submittal, they will be rejected and returned without review.

B. Within fifteen (15) days after contract has been awarded, Contractor to submit to Designer for review a complete list of materials, equipment, and accessories proposed for use, listing the item and manufacturer's name only.

C. Based upon aforementioned approved listing, Contractor to submit One (1) electronic PDF copy of COMPLETE BROCHURES AND SHOP DRAWINGS OF ALL MATERIALS, FIXTURES, AND EQUIPMENT that he proposes to use giving the names of manufacturers, trade name and specific catalog numbers.

D. Brochures to be submitted in time to allow fifteen (15) days from date of receipt in Engineer's office before final approval or disapproval is required to meet construction schedule. Submittals to bear Contractor's stamp of approval evidencing he has examined and checked same and information contained therein is in accordance with contract requirements, and any deviations to be clearly marked. Approval of shop drawings not to be construed as permitting departure from the contractual documents.

E. Above-mentioned brochures to be submitted and approved before any materials are ordered.

F. In the event that within time stated above contractor fails to submit complete list of materials, equipment and accessories in proper form, the Designer reserves the right to select a full line of materials, fixtures, and equipment, which shall be binding upon Contractor for these materials, fixtures, and equipment as the case may be and which shall be used in his work.

G. Brochures: Submit complete descriptions, illustrations, specification data, etc. of all materials, fittings, devices, fixtures, special systems, etc., including the following:
   1. Panelboards.
   2. Wiring devices and plates.
   3. Motor starters and contactors.
   4. Disconnect switches.
   5. Enclosed circuit breakers.
   6. Lighting, including lamps.

H. Proposed items to be clearly indicated when other items are shown on same sheet. When proposing items other than those specified, brochures to contain both specified item sheets and proposed item sheets for ease of comparison. On request from Designer, samples shall be submitted and/or set up, as directed, for inspection and approval. Samples will be returned to Contractor.

I. Shop Drawings: Submit specific shop drawings for major materials including the following:
   1. Motor starters and contactors including custom wiring diagrams.
   2. Fire alarms and smoke detection systems, including point-to-point wiring diagrams.
   3. Emergency power generator system including automatic transfer switches.
   4. Distribution switchboards.
   5. Dimensional layout of all electrical rooms, drawn to scale, with equipment location shown therein. Clearances to be in accordance with NEC and local codes.
   6. Electrical Coordination Study submitted by switchgear manufacturer to include time-current curves and all related breaker data information. Coordination Study must be approved by the engineer prior to order of switchgear.

1.06 OPERATING AND MAINTENANCE MANUALS

A. Prior to final acceptance of the project, furnish to Owner complete bound sets of operation and maintenance manuals of instructions for operation and maintenance of all pieces of equipment and systems provided under this division of specifications.

B. Manuals to also include all submittal data on all materials and equipment. Clearly indicate items provided on this project. A list giving name and address of nearest supply house carrying spare parts and name of Installation Contractor to be given to Owner.

C. Verbally instruct Owner's representatives. Contractor to obtain letter signed by the owner's representative indicating that the in-service training has been completed.

D. Three sets of the following data are required:
   1. Operating and maintenance instructions.
   2. Spare parts lists.
   3. Copies of approved submittal data.

E. Arrange each set of data in an orderly way, and bind each set in a separate 3-ring, hard-cover binder.

F. As soon as data accumulates, prepare one of the sets and deliver to the Owner's Representative, continuously updating this set as additional data is obtained.

G. At completion of work, submit two complete sets of data to the Owner's Representative for distribution to the proper parties.

1.07 DELIVERY AND STORAGE

A. Insofar as possible, deliver items in manufacturers' original unopened packaging. Where this is not practical, cover items with protective materials, to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

B. Store items in a clean dry place and protect from damage.

C. All damaged painted surfaces of equipment to be touched up to match original paint.

1.08 RECORD DRAWINGS

A. Keep a set of blueline prints at the job site exclusively for recording deviations from the drawings.

B. Record locations and depths of buried and concealed conduits from fixed easily identifiable objects, such as building walls. Where conduits are concealed in walls, indicate distances off of building corners or other building features not likely to be disturbed by future alterations.

C. Mark deviations in colored pencils so that work of various systems can be easily identified.

D. When work is completed, record all deviations on clean sepia copies of drawings.

E. Submit three sepia copies of completed "record drawings" to Owner's Representative for distribution.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. All materials and equipment used in carrying out these specifications to be American made unless approved otherwise by the Owner and to be new and have UL listing, or listing by other recognized testing laboratory when such listings are available. Specifications and drawings indicate name, type, and catalog numbers of materials and equipment to be used as "standards" shall not be construed as limiting competition. Contractor may at his option, use materials and equipment when, in the judgment of the Designer, they are equivalent to that specified.

PART 3 - EXECUTION

3.01 COORDINATION

A. Intent:
   1. These sections of specifications and drawings form a complete set of documents for the electrical work of this project. Neither is complete without the other. Any item mentioned in one shall be as binding as though mentioned in both.
   2. The intent of these specifications and drawings is to form a guide for a complete electrical installation. Where an item is reasonably necessary for a complete system but not specifically mentioned, such as pull boxes, fittings, expansion fittings, support hangers, etc., provide same without additional cost to Owner.
   3. Electrical layouts indicated on drawings are diagrammatical only. Exact location of outlets to be governed by project conditions. The Designer reserves the right to make any reasonable changes (approximately 6 feet) in location of junction boxes, or equipment prior to roughing-in of such without additional cost to Owner.

B. Deviations:
   1. No deviations from specifications and drawings to be made without full knowledge and consent of Designer.
   2. Should Contractor find during progress of work that existing conditions make desirable a modification of the requirements of any particular item, report such item promptly to Designer for his decision and instructions.

C. Insofar as it is possible to determine in advance, leave proper chases and openings. Place all outlets, anchors, sleeves, and supports prior to pouring concrete or installation of masonry work. Should contractor neglect doing this, any cutting and/or patching required to be done is at this contractor's expense.

D. Visit site and be informed of conditions under which work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform work involved.

E. Designer to be mediating authority in all design related deviations and disputes arising on the project.

F. Coordinate to assure that proper points of service transformer locations, voltage characteristics and capacity of service are in accordance with contract drawings.

3.02 CUTTING AND PATCHING

A. Repair or replace routine damage caused by cutting in performance of this contract.

B. Correct unnecessary damage caused due to installation of electrical work, brought about through carelessness or lack of coordination.

C. Repairs to be performed with materials which match existing materials and to be installed in accordance with appropriate sections of these specifications.

3.03 TRENCHING, EXCAVATION, BACKFILLING, AND REPAIRS

A. Provide trenching, excavation, and backfilling necessary for performance of electrical work.

B. Trenching and excavation to be unclassified. No extra will be paid in event that rock is encountered.

C. Backfilling to be carefully done using only clean earth thoroughly tamped and compacted below and above embedded items.

3.04 FOUNDATIONS AND PADS

A. Provide foundations and pads required for equipment provided under this division of specifications. Coordinate proper size and location of foundations, pads, anchor bolts, and other items to be built into structure.

B. Concrete to be in accordance with concrete division of these specifications.

3.05 TESTS

A. On completion of work, installation to be entirely free from grounds, short circuits, and open circuits. Perform a thorough operational test in presence of Owner or his representative. Balance all circuits so that feeders to panels be not more than 10% out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

B. Furnish Owner, as a part of closing file, a copy of such tests including identification of each circuit and readings recorded, also the main service ground test as described in Section 26 0526 of these specifications. Test information to be furnished to Owner includes ampere readings of all panels and major circuit breakers, insulation resistance reading of motors and transformers.

C. Prior to final observation and acceptance, test, leave in satisfactory operating condition all electrical systems and equipment including but not limited to the following:
   1. Electrical distribution system.
   2. Ground fault protection system.
   3. Emergency power generation system.
   4. Fire alarm and smoke detection system.
   5. Electric motors for all equipment.
   6. Electric safety devices.
   7. Any alarm system, including generator, door security, etc.

3.06 INSPECTION FEES AND PERMITS

A. Obtain and pay for all necessary permits and inspection fees required for electrical installation.

3.07 IDENTIFICATION OF EQUIPMENT

A. Properly identify all starters, contactors, relays, safety switches and panels with permanently attached black (normal power) or red (essential systems) phenolic plates with 1/4" white engraved lettering on the face of each attached, with two sheet metal screws. Starters and relays connected by the electrical tradesman to be identified by him whether furnished by him or others.

3.08 TEMPORARY LIGHTS AND POWER

A. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary work to be installed in a neat and safe manner in accordance with the National Electrical Code, Article 590, and as required by OSHA or applicable local safety codes.

B. Provide one pigtail socket with 150 watt lamp for every 1000 square feet of floor area, evenly distributed throughout building and with minimum of one pigtail socket per room.

C. Provide one duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets to be 20 amp, single phase located as directed by the contractor.

D. Check with contractor prior to installation to determine if any lighting or power outlets over the maximum quantity noted above are required.

E. Provide service and panelboards required for above lighting and power outlets.

F. Power consumption will be paid for by the Contractor.

G. Check with the Contractor prior to installation to determine whether single phase or three phase service is desired.

3.09 OBSERVATIONS

A. When field observation services are a part of the project scope, Engineer's office will provide periodic observation of the progress of work specified herein. Purpose of the observation is to ensure compliance of Contractor's work with specifications and drawings. Engineer's office will also observe tests required of Contractor as called for in other sections of specifications.

B. Specifications and drawings represent work to be done in view of total project requirements. Final location of conduits, fixtures, panels, switchboards, etc., to eliminate possible conflict with other trades is responsibility of Contractor. Contractor to provide all supervision required for his personnel to ensure that installation is made in accordance with specifications and drawings and all safety rules and regulations are observed. In event of conflicts of work on project with other trades, Contractor to make every reasonable effort to resolve conflict through meetings and discussions with other parties involved, by preparation of drawings or other appropriate action. Only after this has been done shall the Engineer's assistance be requested.

C. When Engineer is requested to visit project to aid in resolution of conflicts or for witnessing tests, he shall be given a minimum of 48 hours notice prior to time his presence is required at job site.

D. Cost of Engineer's time for general observation or test observance as described herein is to be borne by Engineer except in those cases where Engineer has been requested to visit project and upon visiting finds Contractor has caused Engineer an unnecessary visit. It shall be deemed an unnecessary visit in the following circumstances.

1. Due to lack of supervision on Contractor's part.
2. Test is not ready for observation.
3. Engineer is placed in role of determining reason system or equipment is not operating properly, only to find that Contractor has not fulfilled his responsibility in troubleshooting, etc.
4. Contractor requests a trip to check off final punch list items and it is found that no attempt has been made by Contractor to correct previous punch list items.
5. Contractor will be billed for Engineer's time for making unnecessary visit at the rate of $400 per day plus mileage and living expenses.

3.10 WARRANTY-GUARANTEE

A. Designer reserves right to accept or reject any part of installation which does not successfully meet requirements as set out in these specifications.

B. Contractor shall and hereby does guarantee all work installed under this division shall be free from defects in workmanship and materials for a period of one year from date of final acceptance, whichever is earliest. The above parties further agree that they will repair and replace any defective material or workmanship which becomes defective within the terms of this warranty-guarantee.

END OF SECTION 26 0100

SECTION 26 05 19
CONDUCTORS 600 VOLT AND BELOW

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide a complete system of conductors for lighting, power, and controls throughout building.

B. Refer to drawings for sizes of conductors.

PART 2 - PRODUCTS

2.01 CONDUCTORS - POWER AND LIGHTING

A. Provide 98% conductivity copper conductors with 600-volt insulation.

B. Interior conductors shall be Type THHN-2/THWN-2 insulation.

C. 600-volt insulation for conductors installed in underground raceways shall have XLP (cross-linked polyethylene) insulation, Type XHHW-2.

D. For feeder and branch circuit conductors No. 12 AWG and No. 10 AWG, provide solid type.

E. For all control and motor circuits, and all conductors No. 8 AWG and larger, provide stranded type.

F. Conductors shall be manufactured by Triangle, Phelps Dodge, Southwire, or approved substitute.

G. Provide white or gray colored neutral conductors; provide black or color coded phase conductors.

H. Provide No. 14 AWG stranded type THHN fixture conductors, for conductors entering fixtures and in stems of pendant fixtures.

I. Provide type THHN stranded conductors, 90° C for conductors running through continuous rows of fluorescent fixtures.

J. For service entrance conductors and panel feeders (#1/0 and larger), stranded aluminum conductors of equivalent ampacities may be substituted. Increase conduit sizes to accommodate larger aluminum conductors.

K. Where permitted by local codes, Type MC cable may be used for branch circuits routed concealed above ceilings or in walls.

2.02 CONDUCTORS - CONTROLS

A. Single Conductor
   1. Class B stranded soft-drawn copper with 600 volt thermoplastic insulation.
   2. Size 14 AWG.
   3. Type THHN/THWN.

B. Multiconductor
   1. 600 Volt insulated Type TC
   2. 16 AWG stranded (7x24) copper
   3. PVC insulation – unshielded
   4. 90º C rating

2.03 DATA CONNECTIONS

A. Ethernet shall be CAT-6 manufacturer’s rated cable.
   1. Industrial Ethernet cable with 300 volt PVC jacket
   2. RJ-45 Compatible

3. Gigabit Ethernet, Ethernet I/P compliant
4. Temperature Rating: 75° C.

B. Ethernet Fiber Optic cable shall be multimode with the following features.
1. Fiber Type: OM3 50/125 (µm) Micron multimode.
2. 12 strand fiber unless specifically detailed on plans
3. Gigabit Ethernet compatible.TIA/EIA 455 certified for crush and impact resistance.
4. 300 volt PVC insulated.
5. Temperature Rating: 70° C.

C. Serial RS-485 cable shall be 22 gauge twisted, shielded pairs (2-pair).
1. 100% foil covered.
2. 65% braid.
3. 120 ohm characteristic impedance.
4. 11 pF/ft conductor to conductor and 20.9 pF/ft conductor & shield.
5. 300 volt, 60°C PVC jacket.

D. Allen-Bradley DH+ cable.
1. Twinax shielded cable.
2. Nominal characteristic impedance: 78 ohms
3. Nominal inductance: 0.13 µH/Ft
4. Nominal capacitance: 19.7 pF/Ft conductor to conductor.
5. Outer jacket: 300 volt PVC for dry installation and Polyethylene for wet applications.
6. Temperature Rating: 80° C.

E. ControlNet cable
1. RG-6/U Coax with 18 AWG solid copper conductor
2. Quad shielded with 100 % coverage
3. Nominal characteristic impedance: 75 ohms
4. Nominal inductance: 0.093 µH/Ft
5. Nominal capacitance: 16.3 pF/Ft conductor to shield.
6. Outer jacket: PVC for dry installation and PVDF for wet applications.
7. Temperature Rating: 75° C

F. ODVA DeviceNet (Thicknet) Cable
1. Multiconductor cable with stranded conductors.
2. 15 & 18 AWG tinned conductors for bus power and data.
3. 65% coverage braided shield
4. Impedance per pair: 120 ohms
5. Nominal capacitance: 12 pF/Ft (18 AWG pair)
6. 600 volt PVC outer jacket
7. Temperature Rating: 75° C.

G. ODVA DeviceNet (Thinnet) Cable
1. Multiconductor cable with stranded conductors.
2. 22& 24 AWG tinned conductors for bus power and data.
3. 65% coverage braided shield
4. Impedance per pair: 120 ohms
5. Nominal capacitance: 12 pF/Ft (18 AWG pair)
6. 600 volt PVC outer jacket
7. Temperature Rating: 75° C.
8. Rated for NEC Class II application.

H. Foundation Fieldbus or PROFIBUS Cable
1. 18 AWG stranded tinned copper twisted conductors
2. 100 % overall aluminum foil-polyester shield with drain wire
3. Inductance: 0.19 µH/Ft

4. Impendence: 100 ohms at 0.03125 MHz
5. Nominal Capacitance: 24 pF/Ft conductor to conductor
6. 300 volt PVC outer jacket
7. Temperature RATING: 105° C

2.04 ACCEPTABLE MANUFACTURERS AND TYPES - CONTROLS, INSTRUMENTATION, DATA CONNECTIONS AND THERMOCOUPLE

A. Use Belden or approved substitute.

B. Control Wiring: Belden 27090A multiconductor cable

C. Instrumentation: Twisted Pair – Belden 1032A or Belden 3076F cable.

D. Instrumentation: Twisted Triad – Belden 1031A cable.

E. Thermocouple Extension: Belden 311xA series cable where x = thermocouple type.

F. Ethernet Cable: Belden 7953A DataTuff Cat-6 shielded cable

G. Ethernet Fiber: Belden I100655 Fiber – TrayOptic fiber cable.

H. RS – 485 Cable: Belden 3107A cable

I. ControlNet Cable: Belden 3092A or 3093A for underground and wet locations

J. DH+ Cable: Belden 9463 or Belden 9463DB for underground locations

K. DeviceNet: Belden 9880 (Thicknet) or 9907 (Thinnet)

L. Foundation Fieldbus and PROFIBUS Cable: Belden 1327A (2 – Pair) for connection from control cabinet to segment protector and Belden 3076F (1 – Pair) for instrument drop connection.

2.05 TYPE MC CABLE

A. Type MC Cable shall not be used without prior written approval from the Owner. If approval is given, MC Cable shall only be permitted as allowed by local code and as described below.

B. Maximum length of MC Cable per branch circuit shall be limited to 35 feet after transition from EMT. MC Cable shall not be permitted directly inside a panelboard. EMT conduit shall be used from the panel.

C. MC Cable shall not be permitted for use within mechanical, electrical, or telecommunications rooms.

D. MC Cable shall not be used for exposed branch circuits or wet locations.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install pull boxes in circuits or feeders over 100' long.

B. All conductors shall be continuous from origin to panel or equipment termination without splices where possible. Where splices and taps are necessary or are required, they shall be made in splice boxes with suitable connectors.

C. Make all splices or connections only at outlet, pull or junction boxes.

D. Use pulling compound to pull conductors.

E. Install instrument and data connection conductor in separate raceways from all other conductors. Separate control wiring from power wiring in separate raceways. Separation distances shall be as specified by control system manufacturer or as listed in IEEE Standard 518, whichever is greater.

F. Bend radius on conductors shall be less than the limitations listed by the cable manufacturer.

G. Deliver all conductors to job site new and in original wrapping, package or reel.

H. All conductors and connections shall test free of grounds, shorts, and opens.

I. For 20-amp, 120-volt branch circuits, provide No. 10 wire in lieu of No. 12 wire for any branch circuit in excess of 90 linear feet to prevent excessive voltage drop. Where branch circuit exceeds 175 linear feet, use No. 8 wire.

J. Use Ideal wing nuts, Scotchlok Type Y, R, G, or B, or approved equivalent connectors for fixture connections at outlet boxes.

K. Make feeder taps and joints with OZ type T, PT, PM or PTS, or approved equivalent clamp connectors as manufactured by Kupler, or with approved compression sleeves. Wrap connectors with No. 10 electro-seal or approved equivalent plastic filler and vinyl tape.

L. Use only compression lugs equal to T & B series 60,000 for termination of aluminum conductors.

M. Leave a minimum of 8" slack wire in every outlet box whether it be in use or left for future use.

N. Color code conductors as follows:

CONDUCTOR COLOR CODE	
	120/208 Volt
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

O. If the above conflicts with existing color coding, match existing.

P. Use factory color coded conductors where commercially available. If not, use black wire and band with color tape.

END OF SECTION 26 0519

SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The entire system of raceways and equipment to be grounded in accordance with Article No. 250 of latest edition of National Electrical Code and any local regulation or governmental governing authority.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Main service switchboard or panelboard shall be bonded to street side of first flange or coupling of incoming main water line serving project with heavy-duty ground clamp in accordance with Article 250.104 of N.E.C. The grounding electrode conductor shall be sized in accordance with Table 250.66 of N.E.C. An additional ground wire of same size shall be run to a tripod grounding rod system driven in ground outside foundation of building. This system shall consist of three 3/4" x 10' copperweld ground rods driven in ground in an equilateral triangular configuration with a minimum of 15' spacing between each. Connection of each ground rod to one another shall be made using a conductor of same size as being run for main service ground. Building steel shall be connected to ground bus on main service with a conductor the same as required on the service. This ground will be in addition to the previously specified grounds.

2.02 GROUND CLAMPS

A. OZ Electrical Manufacturing Company, Steel City, Appleton, or approved substitute.

B. Feeder circuits to panels, motor control centers, etc., shall have a separate green grounding conductor in conduit sized in accordance with Table 250.122 of N.E.C.

C. All branch circuits shall have a separate green grounding conductor installed in same conduit as phase and neutral conductor from panel ground bus to device. The grounding conductor shall be sized in accordance with Table 250.122 of N.E.C.

D. Flexible conduit will not be approved as achieving continuity of ground. All flexible conduit shall have a jumper wire sized to ampacity of branch breaker and shall be connected to conduit system on both ends; this applies to fixtures, motors, controls, etc.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground busses.

B. Provide a shunt path around main water meter by bonding around both sides of meter to assure continuity.

C. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

D. Clean all non-conductive surfaces on equipment to be grounded, to assure good electrical continuity.

E. Ground on main service shall be tested to obtain no greater than 10 ohms using 3-Point Fall of potential test. Test data shall be submitted to Engineer for review and such test data shall become a part of the final brochure.

END OF SECTION 26 0526

SECTION 26 05 29
SUPPORTING DEVICES AND HANGERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide a system of supporting devices and hangers to ensure secure support or bracing for conduit, electrical equipment, including safety switches, fixtures, panelboards, outlet boxes, junction boxes, cabinets, etc.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide appropriate supporting devices and hangers as manufactured by Erico Products, Inc., Steel City, Rayco, or approved substitute:
   1. Vertical flange clamps (beam clamps).
   2. "Z" purlin clips.
   3. Conduit clips.
   4. Universal clamps (Beam clamps).
   5. Beam clamps (set screw type).
   6. Combination push-in conduit clips.
   7. Combination conduit hanger clamps.
   8. Flexible conduit clips.
   9. Special combination conduit clips.
   10. One hole steel straps.
   11. Minerallac conduit hangers.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Secure conduits to within 3' of each outlet box, junction box, cabinet, fitting, etc., and at intervals not to exceed ten feet (10') for EMT and IMC conduit and in accordance with Table 344.30 (B) (2) for Rigid Steel conduit.

B. Install clamps secured to structure for feeder and other conduits routed against the structure. Use drop rods and hangers or racks to support conduits run apart from the structure.

C. Furnish and install suitable angle iron, channel iron or steel metal framing with accessories to support or brace electrical equipment including safety switches, fixtures, panelboards, outlet boxes, etc.

D. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat if appropriate to match the surrounding metal surfaces. (Prepainted or galvanized support material is not required to be painted or repainted.)

E. Secure type "NM" (Romex) non-metallic sheathed cable, with appropriate staples or straps, to within 12" of outlet boxes; and, at intervals not to exceed 4-1/2 feet, in accordance with N.E.C.

F. Secure Type "AC" armored cables with appropriate straps or staples to within 12" of outlet boxes and at intervals not to exceed 4-1/2 feet in accordance with N.E.C.

G. Support all fixtures including lay-in troffers from the structure as detailed on the drawings to comply with seismic requirements for the specific area.

H. Use of chains, perforated iron, bailing wire, or tie wire for supporting conduit runs will not be permitted.

I. For support of low voltage wiring not required to be in conduit, Contractor shall bundle cables together in a neat manner using approved nylon tie wraps. Bundled cables shall be supported with "J" hooks on telephone type bridle rings, a minimum of 6 feet on centers. Contractor shall clearly identify all differing types of cables being run and tag them with tape tags reading "security", “data”,etc., for the appropriate system cables. Identification tape shall be provided at minimum intervals of 25 feet on center and within each building space.

END OF SECTION 26 0529

SECTION 26 05 34
RACEWAYS AND CONDUIT SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide a complete conduit system with associated couplings, connectors, and fittings.

B. Conduits shall be mechanically and electrically continuous from outlet to outlet and from outlets to cabinets, pull or junction boxes.

1.02 SUBMITTALS

A. Submittal for products furnished under this section is not required.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. IMC, RGS and EMT conduit shall be hot-dip galvanized, or electrogalvanized steel by Allied, Wheatland Tube, Republic Conduit, Western Tube, or approved substitute.

B. Erickson couplings for IMC and RGS, shall be used where neither length of conduit can be rotated.

C. IMC/RGS conduit connectors from 1/2” to 4” trade sizes shall use compression type.

D. EMT conduit connectors from 1/2” to 2” trade sizes shall use set screw type. EMT conduit connectors from 2-1/2” to 4” trade sizes shall use two set screw type.

E. EMT conduit connectors from 1/2” to 4” trade sizes shall use compression type.

F. Weatherproof hub shall be complete with sealing "O" ring or sealing locknuts.

G. Provide polyvinyl chloride (PVC) conduit, Type 40, and associated couplings, connectors, and fittings. PVC conduit shall be UL listed and 90 degrees C UL rated.

2.02 ELECTRICAL METALLIC TUBING (EMT)

A. Use Electric Metallic Tubing (EMT) for:
   1. Branch circuits installed overhead, both exposed and concealed, installed more than 6 feet above finished floor.
   2. Branch circuits originating from isolated panels (O.R., Cystoscopy, or Delivery).

2.03 INTERMEDIATE METAL CONDUIT (IMC)

A. Use Intermediate Metal Conduit (IMC) for:
   1. Panelboard feeders.
   2. Branch circuits installed in hazardous areas.
   3. Branch circuits and feeders installed in concrete slabs at ground floor.
   4. Branch circuits installed exposed below 6 feet above finished floor.
   5. Branch circuits installed in wet locations.
   6. Pendant drops.

2.04 RIGID GALVANIZED STEEL (RGS)

A. Conduit Use:
   1. Interior and exterior exposed primary service conduit.

2. Interior and exterior exposed secondary service conduit.
3. Exterior exposed branch circuits.

2.05 POLYVINYL CHLORIDE (PVC)

A. Use PVC for:
   1. Service entrance conduits for power encased in concrete.
   2. Service entrance conduits for telephone.
   3. Exterior feeders encased in concrete.
   4. Exterior underground branch circuits.
   5. Primary power conduits encased in concrete.

B. PVC conduit shall not be used for feeders or branch circuits inside the building.

2.06 FLEXIBLE METAL CONDUIT

A. Provide a flexible metal conduit system for the termination points at equipment that may possibly vibrate such as motors, welders, etc. The length shall not exceed 6 feet.

B. Conduit shall be electrically continuous from outlet or conduit end to the utilization equipment.

C. The total length of flexible conduit in any circuit shall not exceed 6 feet.

D. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight flexible type, U.L. Type EF.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Minimum size of conduits shall be 1/2 inch.

B. Conduit joints shall be cut square, threaded, reamed smooth, and drawn up tight so conduit ends will butt in couplings, connectors, and fittings.

C. Make bends or offsets with standard ells or field bends with an approved bender.

D. Run conduits concealed in floor slabs, below slabs, or in walls in direct line with long sweep bends or offsets. Run exposed conduits and conduits run above lay-in ceilings parallel to and at right angles to building lines. Group multiple conduit runs in banks.

E. Secure EMT conduits to all boxes and cabinets with a steel set screw on the outside and a locknut on the inside.

F. Cap ends of conduits to prevent entrance of water and other foreign material during construction.

G. Complete conduit systems before pulling conductors.

H. Provide cable supports in conduits rising vertically in accordance with the National Electrical Code, Article 300-19.

I. Provide nylon pull cord in all empty conduits. Steel wire not acceptable as pull wire.

J. Conduits which pass through floor slabs (except ground floor) shall be sealed with concrete grout. Seal around conduits or other wiring materials passing through partitions, which extend to the underside of the slab above, and those passing through smoke partitions and fire-rated walls. Refer to appropriate details on architectural and mechanical drawings.

K. Conduits which enter crawl space, tunnels, and basements from outside the building shall be grouted-in to prevent entry of gases, vapors, insects, or rodents to these spaces from street mains.

L. Conduit not serving elevator equipment shall not be permitted to pass through elevator shafts or elevator equipment rooms.

M. Where IMC or RGS conduit is installed in a cabinet, junction box, pull box, or auxiliary gutter, conductors shall be protected by an insulated bushing. Locknuts shall be installed on conduit outside and inside enclosure.

N. In areas where enclosed and gasketed fixtures and weatherproof devices are specified, where rigid conduit enters a sheet metal enclosure, junction box and outlet box, and not terminated in a threaded hub, a steel, or malleable iron nylon insulated hub, complete with recessed sealing "O" ring or sealing locknut shall be used.

O. Where conduits stub up in conduit space beneath switchgear and do not connect directly to equipment enclosures, use malleable iron nylon insulated ground bushing with a lay-in lug design complete with bonding screw, Raco 1212-1296.

P. Provide seal-off fitting in all conduits entering hazardous areas and any conduits entering a cold temperature area such as freezers and dry refrigerators.

Q. In concrete slabs, block up conduit from forms and securely fasten in place. All conduits in slabs shall have a minimum of 1-1/2 inches concrete coverage above and below.

R. Encase in 4 inches of 1:2:4 mix concrete on all sides all feeder conduits laid below ground outside building foundation line.

S. Where conduits running overhead pass through building expansion joints they shall be connected by flexible metal conduit of same size with sufficient slack to allow conduits on either side of expansion joint to move a minimum of 3 inches in any direction. Provide supports as required on each side of expansion joint, all in accordance with seismic requirements of specific area.

T. Conduits for feeders and branch circuits shall be terminated directly into panelboard enclosure without the use of pull boxes, junction boxes, wireways, or auxiliary gutters, unless the panelboard enclosure does not provide sufficient surface area for all conduits. Where such cases exist, the contractor shall notify the Designer. In no case will splices in such boxes, wireways, etc., be permitted.

U. Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit, and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure. Equipment requiring servicing shall be readily accessible.

3.02 EMT

A. Do not use electric metallic tubing in cinder concrete or cinder fill where subject to permanent moisture unless protected on all sides by a layer of noncinder concrete at least 2 inches thick or unless the EMT is at least 18 inches under the fill. Use of set-screw fitting is not acceptable in concrete or in fill under slab.

3.03 PVC

A. Use threaded fittings for all connectors and adapters.

B. Provide code sized ground conductors in all power conduit runs.

C. Provide 1/4-inch nylon pull rope in all primary power and incoming telephone service entrance conduits.

D. Encase all PVC conduit in reinforced concrete with a minimum of 4-inch encasement on all sides except exterior branch circuits.

E. No PVC shall emerge from the ground or the concrete slab or encasement. PVC shall convert to galvanized rigid metal prior to its emergence.

F. Make bends with standard ells or with an approved heat bender.

3.04 FLEXIBLE METAL CONDUIT

A. Flexible metal conduits shall be 1/2 inch minimum size.

B. Where fittings for liquidtight flexible conduit are brought into an enclosure with a knock-out, a gasket assembly, consisting of one piece "O" ring, with Buna-N sealing material, Raco Series 3500, shall be installed on outside of box. Fittings shall be made of either steel or malleable iron only, and shall have insulated throats or insulated bushings.

C. In dry locations, where final connections to motors and other equipment may be made with flexible metal conduit, fittings shall be of steel or malleable iron only with insulated throats or insulated bushings, and shall be of wedge and screw type having an angular wedge fitting between convolutions of conduit.

D. An additional copper ground wire shall be installed inside of flexible conduit and bonded at each end to assure continuity of ground to lighting fixtures, controls, and other utilization equipment.

E. All recessed lighting fixtures shall be connected with flexible metallic conduit from outlet box to fixture. Rigid conduit connections to lighting fixtures are not acceptable.

F. Install liquidtight flexible conduit in such a manner as to prevent liquids from running on the surface toward fittings.

G. Allow sufficient slack conduit to reduce the effect of vibration.

END OF SECTION 26 0534

SECTION 26 05 37
OUTLET BOXES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide each fixture, switch, receptacle, communication devices, and other wiring devices with a galvanized outlet box of appropriate size and depth for its particular location and use unless indicated otherwise.

1.02 SUBMITTALS

A. Submittals are not required for items furnished under this section.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Outlets and junction boxes shall be Steel City or approved substitute.

B. Provide 4" square x 1-1/2" deep boxes for switches and receptacles in drywall partitions. Use square cut plaster rings of proper gauge and depth.

C. Provide 4" x 1-1/2" octagonal boxes for ceiling outlets. For increased cubic capacity provide 4" x 2-1/8" octagonal, 4" x 1-1/2" square or 4" x 2-1/8" square boxes for ceiling outlets.

D. Provide 4" x 3-1/2" octagonal concrete rings with removable back plates and fixture studs for ceiling outlets in prestressed or reinforced concrete slabs.

E. Provide 2-1/2" x 3-3/4" one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity provide 3-1/2" x 3-3/4" one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4" square boxes with square cut device covers not less than 1" deep specifically designed for this purpose. Use round edge plaster rings only if the block walls are to be plastered. Use sectional or gangable type outlet boxes only in dry wall construction.

F. For all systems boxes, provide 4-11/16" square outlet boxes with square cut device corners for block walls or round edge plaster rings for plastered walls. Single gang device boxes are not acceptable.

G. Permanent barriers shall be furnished in multi-gang boxes if the voltage between adjacent wiring devices exceeds 300 volts.

H. Provide galvanized malleable iron fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlet only for ceiling fixture outlets.

I. Provide galvanized malleable iron condulets with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere or damage or mar the appearance of the installation.

J. Provide rectangular boxes for floor outlets. Boxes to be 2-gang or 3-gang, fully adjustable before and after concrete pour, Steel City No. 642-643. Cover to be Steel City No. P64-D4/P6DS, aluminum, with duplex screw cover for duplex receptacle. Carpet flange to be lexan type. Fittings to be Steel City No. SFH50, satin aluminum for high tension and Steel City No. SFH50-TEL, satin aluminum for low tension. For boxes in elevated slabs less than four inches thick, use Steel City 642 and 643-SC.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Locate boxes to prevent moisture from entering or accumulating within them.

B. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed. See Article #370 of the latest edition of the National Electrical Code.

C. Effectively close unused openings in boxes with metal plugs or plates.

D. Set recessed boxes so that front edges are flush with finished surfaces.

E. Secure boxes to surfaces upon which they are mounted or embed boxes in concrete or masonry. Support boxes from structural members with approved braces.

F. Install blank device plates on outlet boxes left for future use.

G. Provide bushings in holes through which cords or conductors pass.

H. Install boxes so that the covers will be accessible at all times.

I. Outlet boxes in walls shall not be mounted back to back. Where drawings show outlets on both sides of the same wall, the boxes shall be staggered sideways and connected with short nipples to prevent passage of sound. Where outlets are mounted on both sides of same fire wall they are to be staggered a minimum of 24 inches to maintain the ratings of the wall.

J. Where required to hang a specified fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

END OF SECTION 26 0537

SECTION 26 05 38
PULL AND JUNCTION BOXES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide pull and junction boxes of appropriate size and depth or as indicated on the drawings and as specified hereinafter.

1.02 SUBMITTALS

A. Submittals of products furnished under this section are not required.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/MATERIALS

A. Pull and junction boxes shall be by Hoffman or approved substitute.

B. For interior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, screw covers, etc.

C. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints, 3/4 inch flanges, bolted covers with full gaskets forming a completely water-tight assembly, equal to Hoffman, Concept Series.

D. For exterior work in graded areas outside the building, provide heavy duty sidewalk junction boxes externally flanged for flush mounting. Covers to be fully gasketed, watertight and secured with plated screws or bolts. Crouse-Hinds Type WJB or approved substitute.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4 inches square and 2-1/8 inches deep. Provide screw covers for junction boxes.

B. Use minimum 16 gauge steel for pull boxes and provide with screw cover.

C. Install boxes in conduit runs wherever necessary to avoid long runs or excessive bends. Do not exceed 100 foot runs, or three 90 degree bends, without pull boxes.

D. Rigidly secure boxes to walls or ceilings. Use of conduit as a support is not acceptable.

E. Install boxes in accessible locations. Size boxes in accordance with Articles No. 312 and No. 314 of the latest edition of the National Electrical Code.

F. Install boxes so that the covers will be accessible at all times.

G. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box. Emergency system and normal system circuits shall not be routed through a common pull or junction box.

END OF SECTION 26 0538

SECTION 26 05 43
UNDERGROUND ELECTRIC SERVICE

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Service will be underground and will be a 208/120-volt, 3-phase, 4-wire, wye system.

B. System will be serviced by Pacific Power.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Service to be grounded in accordance with latest edition of National Electric Code, Article No. 250, and any special requirements as required by municipal, state, or federal authorities having jurisdiction.

B. Metering shall be provided as required by the power company. Coordinate final location with utility company, provide mounting support system as required for CT cabinets, metering cabinets, etc.

C. Terminal pole, transformers, lightning arrestors, etc., to be provided by power company.

D. Meter base to be provided by the power company and installed by Division 26 on building where indicated on drawings. Division 26 to provide a 1-1/4" conduit from power company current transformers to meter base where indicated, all to be coordinated with power company to obtain final location.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Contractor to provide secondary conduit, wire, service heads, excavation, backfill, concrete, etc., from a point approximately 25' up pole (to be coordinated with power company) to main service disconnect within building.

3.02 SERVICE COORDINATION

A. Division 26 shall be responsible for coordination with power company to determine final exact location of transformer pole and point of service and shall furnish a breakdown of loads for the power company.

END OF SECTION 26 0543

SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide circuit breaker type panelboards as indicated on drawings and as specified in this section.

B. Refer to drawings for numbers of branch circuits, their ratings, number of poles, arrangements, etc.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Provide panelboards by Square D, ABB, Siemens, or Eaton. Square D type designations are used to indicate type and quality of panelboards.

B. Lighting panelboards for 120/208-volts, 3-phase, 4-wire service shall be Square D type NQ.

C. Lighting panelboards for 277/480-volts, 3-phase, 4-wire service shall be Square D type NF.

D. Power panelboards for 120/208-volt, and 480/277-volt, 3-phase, 4-wire service shall be Square D I-Line distribution type.

E. Lighting and power panelboards and their associated circuit breakers shall be furnished with a short-circuit current rating greater than the available fault current shown on the panel schedules.

F. Series rated panelboards are not acceptable.

G. Provide panelboards of circuit breaker, dead-front safety type, UL labeled and meeting all applicable requirements of the National Electrical Manufacturers Association.

H. Provide panelboards with lugs (both main lugs and branch circuit lugs) suitable and UL approved for aluminum and copper 75 degree C rated conductors.

I. Provide shunt trip and GFI breakers where indicated on panel schedule.

J. Provide electrically isolated neutral bars.

K. Provide separate ground bars complete with lugs or connectors on bar.

L. Provide panelboards with sequence phased bus bars or distributed phase bussing for: 3-phase, 4-wire, 120/208-volts wye.

M. Provide panel doors equipped with chrome-plated locks and catches, all keyed alike. Provide two keys for each lock. Provide fronts with adjustable indicating trim clamps.

N. Provide thermal magnetic circuit breakers which are fully rated and temperature rated for a 40 degree C ambient. Breakers shall be quick-make, quick-break type with trip indication shown by handle position other than ON or OFF and with a common trip on all multi-pole breakers.

O. Where specific panelboard types, breaker types, or adjustable breaker devices are shown on the drawings, and the contractor elects to use another manufacturer or type, contractor will be responsible for additional cost incurred by the designer for evaluation of breaker coordination.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ground separate ground bars to panel boxes and to the main service entrance ground bus with a code-sized grounding conductor installed in the same conduit as the phase and neutral conductors.

B. Install all circuits which use a common neutral in accordance with the latest edition of the National Electrical Code, Article Nos. 210-4, 210-5, 215-4, and 220-4d. Balance all circuits to achieve not greater than 10% unbalanced neutral current in panel feeders.

C. Provide six circuit breaker handle lock-on devices for each lighting panelboard for installation by the contractor on circuits as directed by the Owner to prevent unauthorized personnel from turning off circuits to controls, unit heaters, clocks, night lights, etc. Turn the spare lock-on devices over to the Owner for his use.

D. Provide typed directory cards mounted under plastic on the doors of all panelboards. The directories shall indicate the type of devices being served, including the space number or space names in which the devices or fixtures are located.

E. Provide engraved Bakelite nameplates for all the circuit breakers in use on power panelboards. Indicate the device, panel, or motor being served with 1/4" high letters. Provide nameplates without engraving for the spare breakers and/or spaces. Secure all nameplates to the panelboard trim with two roundhead sheet metal screws.

F. Provide engraved Bakelite nameplates on the visible face of all lighting and power panels indicating the panel designation in 3/8" letters. Secure the nameplates with a minimum of two round-head sheet metal screws. Normal power nameplates shall be black and emergency power nameplates shall be red.

G. Provide 7 sets of final as-built drawings for the panels after delivery of the panels for distribution by the Owner.

END OF SECTION 26 2416

SECTION 26 27 26
WIRING DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide switches, receptacles, device plates, and other wiring devices as indicated on drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Acceptable manufacturers include Leviton, Hubbell, Eagle, Arrowhart, Pass and Seymour, and Bryant. Leviton numbers are used for clarity.

2.02 SWITCHES

A. 20-Amp, 120/277 VAC:
   1. Single pole: Leviton No. 1221-2W.
   2. Three-way: Leviton No. 1223-2W
   3. Single pole, weatherproof: Leviton No. 1221-2W with Steel City No. SW1-C weatherproof plate.
   4. Single pole with pilot light (120 VAC): Leviton No. 1221-PLC.
   5. Momentary contact switch: Leviton No. 1257.

B. Dimmers shall be universal (LED/CFL/MLV/Incandescent) slide dimmers equal to Leviton DSM10-1LZ.

2.03 RECEPTACLES

A. 20-Amp, 125-VAC, NEMA 5-20R:
   1. Duplex type: Leviton No. 5362-W (white).
   2. Ground fault circuit interrupter: Leviton No. MGFN2-W (white).
   3. GFCI Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton G5362-WTW (White).
   4. Weatherproof “In Use”, extra-duty type cover: Leviton 5980-UCL.
   5. Duplex type, heavy-duty industrial grade, Weather and Tamper-Resistant: Leviton TWR20-W (White).
   6. Tamper resistant type: Leviton 5362-SGW (white).
   7. Duplex isolated ground type: Leviton 5362-IGW (white).

2.04 MISCELLANEOUS DEVICES

A. Twist lock receptacle: Hubbell No. 23000-HG series or approved substitute.

B. Flush dryer receptacle, 30-amp, 125/250 VAC: Leviton No. 5207 with No. 84028 plate.

C. Flush range receptacle, 50-amp, 125/250 VAC: Leviton No. 5206 with No. 84028 plate.

D. Clock outlet: Leviton No. 5261CH.

2.05 DEVICE PLATES

A. Provide Leviton Series 84 stainless steel Leviton Series 80 nylon plates (white), or approved substitute. Provide cast alloy or stamped metal plates on all exposed switches and receptacles.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mounting:
   1. Mount all switches 46" above the finished floor to centerline of switch unless noted otherwise.
   2. Mount all receptacles 18" above the finished floor to centerline of receptacle unless noted otherwise.
   3. Mount weatherproof receptacles vertically.
   4. Work devices to nearest block course using proper type outlet boxes as specified under [Section 26 0537]. Check architectural and furniture drawings for counter (desk, special booth etc.) locations. Mount devices above work counters. Verify other special mounting conditions and locate devices as required.

B. Polarity: Properly wire all convenience outlets so that the hot wire, the neutral wire and the ground wire connect to the proper terminal on all receptacles.

C. Grounding: Install all receptacles in boxes specified under [Section 26 0537], and install a No. 12 green ground wire from device grounding terminal back to the grounding bus in the panelboard and bond to outlet box.

D. Receptacles shown on the drawings as "special mounting height" shall be installed at mounting height as indicated on drawings. Where no mounting height is given and receptacles are above counters (or casework), they shall be mounted with centers 4" above top of counter. If the counter has a backsplash, receptacles shall be mounted with centers 4" above top of backsplash. Where special mounting height receptacles are not above counters and no mounting height is indicated, receptacle mounting heights shall match adjacent light switches or above counter receptacles. The Contractor shall coordinate the installation of all special mounting height receptacles with architectural design.

E. Install device plates in full contact with wall surface. Plates shall not project out from the wall.

F. Install device plates in full contact with surface-mounted box. Plates shall not project out from the edge of the box.

END OF SECTION 26 2726

SECTION 26 28 18
SAFETY SWITCHES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide horsepower-rated, quick-make, quick-break, safety switches provided with the number of poles and fuses as required.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Safety switches shall be as manufactured by General Electric, Square D Company, Cutler-Hammer, or approved substitute.

B. For 208- and 240-volt circuits, use general-duty type switches with Class R fuse clips. For 480-volt circuits, use heavy-duty type switches with Class R fuse clips.

C. Switches shall have arc shields, shall be of enclosed construction and fusible or non-fusible as indicated. Switches shall be rated for either 250-volt AC or 600-volt AC service as required.

D. Safety switches for all part-winding or two-speed motors requiring remote disconnect to be similar to Square D Series HLL-660, six-pole.

E. Switches shall have Electrical Interlock Kit with one normally open and one normally closed contact.

F. All switches shall be capable of interrupting locked rotor current of motor which it serves.

G. Enclosures to be NEMA-1 for interior use and NEMA-3R for exterior use unless noted otherwise.

H. Provide dual-element Bussman type FRN (250 volt) or type FRS (600 volt) fuses for any fusible safety switch serving a motor circuit.

I. For non-motor loads, provide dual element Bussman type LPN (250 volt) or type LPS (600 volt).

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide non-fusible switches at remote motor locations (raintight where required) as indicated on drawings.

B. Provide fusible disconnects at package A/C units, fused as specified on unit nameplate.

C. Mount switches to walls or adjacent to equipment enclosures using unistruts with a minimum of four bolts using toggle anchors for masonry construction, Phillips "Red Head" anchors for poured concrete construction and bolts, jumbo washers, lock washers and nuts for equipment enclosure mounting.

D. All safety switches to be identified with Bakelite nameplates.

END OF SECTION 26 2818

SECTION 26 29 13
INDIVIDUAL STARTERS AND CONTROLS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide conduit, wiring and electrical connections to motors, safety switches, starters, relays, electrical interlock circuits, valves, unit heaters, fan coil units, pumps, air handling units, etc., complete and ready for operation. The Division 26 contractor shall review the electrical requirements of other sections and divisions of these specifications and drawings and provide the required power and control wiring.

B. Provide starters as shown on mechanical drawings and as scheduled on Electrical Drawings except custom designed starter such as chiller machine, those physically mounted on the unit such as a deaerator, or any piece of equipment where starter is furnished as an integral part of the equipment.

C. Starters shall be installed by Division 26 but provided by Division 23 or other divisions.

D. Control Wiring:
   1. Division 23 shall furnish and install line- and low-voltage control wiring, including conduit, conductors, and terminations for same. Division 23 shall also furnish and install control components associated with the line- and low-voltage control systems and shall wire and connect components in accordance with approved wiring diagrams.
   2. Division 26 shall furnish and install power wiring including conduit, conductors, and terminations to motors, safety switches, starters, relays, valve and damper actuators, and other components requiring power as indicated on the electrical drawings, by the specifications, and in accordance with approved wiring diagrams. Division 26 shall also furnish and install starters as scheduled on the electrical drawings.

E. Thermocouples and special cables may be provided by the manufacturer of the special equipment. Contractor shall check Division 23 specifications for these requirements.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/MATERIALS

A. Starters shall be as manufactured by Square D, G.E., Cutler-Hammer, or approved substitute.

B. Starters used on 208-volt systems shall have two cartridge fuses in the control circuit.

C. Starters used on 480-volt systems shall have an individual 480/120-volt control transformer with two cartridge fuses in the primary and one in the secondary.

D. All starters to be provided with melting alloy overloads.

E. Starters used inside shall have NEMA 1 enclosures; starters used in damp locations or exposed to the weather to have NEMA 3R enclosures.

F. Manual Motor Starter with Heater Unit: Square D Class 2510.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Connect all pumps, fans, and heating and air-conditioning equipment and have equipment complete and ready for operation. Contractor shall be responsible for checking with equipment manufacturer to obtain exact requirements. Electrical drawings showing mechanical requirements are diagrammatic only to indicate size, type, number of control items, and approximate location.

B. A short section of flexible conduit shall be used at each motor. Watertight flexible conduit shall be used on any motors in damp or exterior locations.

C. Flexible metallic conduit for motor connections shall be 1/2" minimum size.

D. Identify starters and controls as required by Section 26 0100.

END OF SECTION 26 2913

SECTION 26 32 13
DIESEL ENGINE DRIVEN GENERATOR SETS SYSTEM

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This specification includes packaged engine-generator sets for standby power to be installed as per plans and specifications. Unit(s) shall provide for completely automatic unattended operation, for the duration of any loss of normal utility power. Unit(s) to be capable of reaching operating range within 10 seconds of initial start signal (NFPA 99, Chapter 3). Unit(s) shall be of a standby KW/KVA capacity as shown on plans.

B. Full-service responsibility for satisfactory operation and performance of this system shall rest with Division 26 contractor supplying the emergency power system. Engine/generator to be furnished with all necessary features and options to comprise a complete operable system when installed as per manufacturers' recommendations.

C. The generator set covered by these specifications shall be designed, tested, rated, assembled, and installed in strict accordance with all applicable standards below:
   1. ISO8528
   2. UL508
   3. UL2200
   4. UL142
   5. Designed to allow for installed compliance to NFPA 37, NFPA 70, NFPA 99 and NFPA 110.

D. The manufacturer's standard warranty shall in no event be for a period of less than two (2) years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall be limited to 500 hours annually for the system warranty by both the manufacturer and servicing distributor. Submittals received without written warranties as specified will be rejected in their entirety.

E. The authorized manufacturer's dealer must have a generator set service location within 100 miles of the site. The dealer shall have a rental fleet with similar sized generator sets to the generator set(s) being supplied.

F. Unit to be equipped for outdoor installation as shown on drawings.

1.02 RELATED SECTIONS

A. 26 36 00 - Automatic Transfer Switch (ATS)

B. 26 05 26 - Grounding and Bonding for Electrical Systems

1.03 SUBMITTALS

A. Contractor shall provide as part of submittal data: Complete, composite electrical and mechanical drawings indicating control wiring routing, quantity and size, as well as size and suggested routing of coolant, fuel lines and exhaust lines. If options or special equipment other than those specified below are required, they shall be included in the submittals.

B. Engine-generator submittals shall include the following information:
   1. Factory published specification sheet.
   2. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, control panel, enclosure, etc.

3. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories.
4. Weights of all equipment.
5. Concrete pad recommendation, layout, and stub-up locations of electrical and fuel systems.
6. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, control panel, and remote alarm indications.
7. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, fuel consumption, etc.
8. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
9. Generator resistances, reactances, and time constants.
10. Generator locked rotor motor starting curves.
11. Manufacturer's documentation showing maximum expected transient voltage and frequency dips, and recovery time during operation of the generator set at the specified site conditions with the specified loads.
12. Manufacturer's and dealer's written warranty.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/EQUIPMENT

A. Emergency generator shall be by Caterpillar, Generac, Kohler, Cummins, or approved equal.

2.02 GENERAL REQUIREMENTS

A. Genset Requirements: The generator set shall be Standby Duty rated at 130 ekW, 162.5 kVA, 1800 RPM, 0.8 power factor, 208 V, 3-Phase, 60 hertz, including radiator fan and all parasitic loads. Generator-set shall be sized to operate at the specified load at a maximum ambient of 122° F (50° C) and altitude of 5000.0 feet (152.4 m). System voltage to be 208/120-volts, 3-phase, 4-wire, 60 Hz., .8 power factor.
   1. Standby Power Rating: 130 kW
   2. Power is available for the duration of an emergency outage.
   3. Average Power Output = 70% of standby power.
   4. Load = Varying.
   5. Typical Hours/Year = 200 Hours.
   6. Maximum Expected Usage = 500 hours/year.
   7. Typical Application = Standby.

2.03 ENGINE

A. Engine shall be full diesel, compression ignition, liquid-cooled, and capable of producing the rated KW at a governed speed of 1800 rpm as specified under job site conditions. Engine to be equipped with electric starting, battery charging generator, electronic governor, fuel filters, oil filters, air cleaners, cooling system, and other equipment to provide a complete operable system. Selling distributor to be a factory authorized distributor of the diesel engine utilized in the standby engine generator system.

B. The engine will utilize in-cylinder combustion technology, as required, to meet applicable EPA non-road regulations and/or the EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 – D2 Emissions Cycle at specified ekW / bHP rating.

2.04 COOLING

A. The generator set shall be equipped with rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 122°F ambient air entering the room or enclosure (if an enclosure is specified). The generator set supplier is responsible for providing a properly sized cooling system based on the enclosure static pressure restriction. Please assume a 7oF air to core temperature rise across the engine.

B. Engine shall be equipped with thermostatically controlled water jacket heater to maintain minimum 80-degrees F water jacket temperature under ambient conditions. Vendor shall consult with and coordinate special extreme cold weather needs with Electrical Engineer. Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity. Heater shall include a circulation pump. Provide isolation valves that allow for change out of the heater without having to drain the entire system.

C. Complete cooling system shall be filled with anti-freeze coolant (0 degrees F or less as required by the extreme of local weather conditions) supplied by the vendor at start-up.

2.05 OUTDOOR INSTALLATIONS

A. Sound Attenuated Enclosure: The complete diesel engine generator set, including generator control panel engine starting batteries shall be enclosed in a factory assembled, sound attenuated enclosure mounted on the fuel tank base.
   1. A weather resistant, sound attenuated enclosure of 14-gauge steel with electrostatically applied powder coated baked polyester paint. The enclosure shall have a resulting sound level of 75_dba @_23 feet with the genset running under full load. It shall consist of a roof, side walls, and end walls.
   2. Fasteners shall be either zinc plated or stainless steel.
   3. Internally mounted exhaust silencer to meet sound level listed above.
   4. Enclosure door shall include control panel viewing window in order to view generator controller without having to access the generator enclosure. No exceptions.
   5. Acoustical foam shall be provided between all supports and inside doors and sound baffles or air intake and air discharge.
   6. NFPA 110 Level 1 outdoor installations may require motorized automatic dampers at intake and discharge and space heater to maintain 40oF internal temperature.
   7. Load center sized for generator ancillary components.
   8. Radiator Air Discharge must be vertically discharged without exception.

2.06 SILENCERS AND BATTERIES

A. For indoor generator sets, furnish and install super critical grade exhaust silencer. VEE-type engines shall have dual inlet, single outlet. Condensate trap, pet cock drain shall be installed in the silencer. A flexible section, 36 inches minimum, shall be provided between the engine exhaust manifold and the silencer. This section shall be carbon steel bellows type. The silencer shall be provided with mounting brackets for ceiling suspension. The silencer shall be installed from the equipment room ceiling in a horizontal position. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine.

B. Engine/generator manufacturer shall specify exhaust line size required for acceptable back pressure. Exhaust line shall be Schedule 40 pipe and be connected to engine manifold through seamless, flexible, carbon steel bellows type connection. Exhaust systems installed inside structure shall be fully insulated (under Division 23) and lines passing through walls shall pass through sleeves.

C. Provide starting batteries capable of starting unit in time specified under installed conditions and capable of (2) 75-second periods of engine cranking. Batteries to be installed in steel, insulated rack(s).

D. Battery heater pads to be furnished on outdoor installations.

E. Provide batteries of the heavy-duty, maintenance-free lead-acid type, plastic case, shipped dry with electrolyte installed at start-up. Battery cables to be sized and provided by engine/generator vendor. Battery voltage shall be compatible with the starting system.

F. Battery Charger: Current-limiting, automatic-equalizing and float-charging type. Unit shall comply with UL 1236 and include the following features:
   1. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
   2. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from -40°C to +60°C to prevent overcharging at high temperatures and undercharging at low temperatures.
   3. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to ±10%.
   4. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
   5. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
   6. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.07 FUEL TANKS

A. Subbase Fuel Tank:
   1. Provide a double wall sub-base tank constructed to meet all local codes and requirements. A fuel tank base of 24 hour capacity (for NFPA 110 Level 1 systems provide 133% capacity) shall be provided as an integral part of the enclosure. It shall be contained in a rupture basin with 110% capacity. The tank shall meet UL142 standards. A locking fill cap, a mechanical reading fuel level gauge, low fuel level alarm contact, normal and emergency vent extensions to 12', and fuel tank rupture alarm contact shall be provided.
   2. Provide 5 Gallon Fuel Fill spill containment with overfill prevention valve (without exception).

2.08 GENERATOR

A. The synchronous generator shall be dual bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling. The generator shall meet performance class G2 of ISO 8528.
   1. The excitation system shall be permanent magnet and enable the alternator to sustain 300% of rated current.
   2. Form Wound 1500kW and above and above 600V, Random Wound below 1500kW.
   3. Rotor/Stator Temperature rise at 40O Ambient: 105O C.
   4. Insulation Class H.
   5. Subtransient Reactance no greater than 12%.

B. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

C. All load connections shall be made up in rear mount junction box. Generator construction to allow load connections to be made on top, bottom or either side of junction box.

D. Digital Voltage Regulator:
   1. The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain generator output voltage within +/- 0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS in three phases of alternator output voltage or operating in single phase sensing mode. The voltage regulator shall include a VAR/Pf control feature as standard. The regulator shall provide an adjustable dual slope regulation characteristic in order to optimize voltage and frequency response for site conditions. The voltage regulator shall include standard the capability to provide generator paralleling with reactive droop compensation and reactive differential compensation.
   2. The generator set controller shall allow system parameter setup and monitoring and provide fault alarm and shutdown information through the controller. A PC-based user interface shall be available to allow viewing and modifying operating parameters in a Windows compatible environment.

E. Generator Circuit Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
   1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
   2. Ground-Fault Protection: Comply with NFPA 70, signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.
   3. Energy Reduction Maintenance Setting (ERMS): Provide ERMS switch on breakers 1200A and above.
   4. Trip Settings: Selected to coordinate with generator thermal damage curve.
   5. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
   6. Suitable for Service Entrance

F. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector shall perform the following functions:
   1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
   2. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
   3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
   4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.09 GENERATOR CONTROL PANEL

A. Provide a fully solid-state, microprocessor based, generator set control. The control panel shall be designed and built by the engine manufacturer. The control shall provide all operating, monitoring, and control functions for the generator set. The control panel shall provide real-time digital communications to all engine and regulator controls via SAE J1939.

B. Environmental: The generator set control shall be tested and certified to the following environmental conditions:
   1. –40°C to +70°C Operating Range
   2. 100% condensing humidity, 30°C to 60°C
   3. IP22 protection for rear of controller; IP55 when installed in control panel.

4. 5% salt spray, 48 hours, +38°C, 36.8V system voltage.
5. Sinusoidal vibration 4.3G's RMS, 24-1000Hz.
6. Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2).
7. Shock: withstand 15G.

C. Functional Requirements: The following functionality shall be integral to the control panel.
1. Standard ISO labeling
2. The control shall include a minimum 33 x 132 pixel, 24mm x 95mm, positive image, transflective LCD display with text-based alarm/event descriptions.
   a. The control shall include a minimum of 3-line data display.
   b. Audible horn for alarm and shutdown with horn silence switch.
3. Multiple language capability.
4. Remote start/stop control.
5. Local run/off/auto control integral to system microprocessor.
6. Cooldown timer.
7. Speed adjust.
8. Lamp test.
9. Emergency stop push button.
10. Voltage adjust.
11. Voltage regulator V/Hz slope – adjustable.
12. Password protected system programming.

D. Digital Monitoring Capability: The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units.
1. Engine:
   a. Engine oil pressure
   b. Engine oil temperature
   c. Engine coolant temperature
   d. Engine RPM
   e. Battery volts
   f. Engine hours
   g. Engine crank attempt counter
   h. Engine successful start counter
   i. Service maintenance interval
   j. Real time clock
   k. Engine exhaust stack temperature
   l. Engine main bearing temperature
2. Generator:
   a. Generator AC volts (Line to Line, Line to Neutral and Average)
   b. Generator AC current (Avg and Per Phase)
   c. Generator AC Frequency
   d. Generator kW (Total and Per Phase)
   e. Generator kVA (Total and Per Phase)
   f. Generator kVAR (Total and Per Phase)
   g. Power Factor (Avg and Per Phase)
   h. Total kW-hr
   i. Total kVAR-hr
   j. % kW
   k. % kVA
   l. % kVAR
   m. Generator bearing temperature
   n. Generator stator winding temperature
3. Voltage Regulation:

a. Excitation voltage
b. Excitation current

E. Alarms and Shutdowns: The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns are accompanied by a time, date, and engine hour stamp that are stored by the control panel for first and last occurrence:
1. Engine Alarm/Shutdown
a. Low oil pressure alarm/shutdown
b. High coolant temperature alarm/shutdown
c. Loss of coolant shutdown
d. Overspeed shutdown
e. Overcrank shutdown
f. Emergency stop shutdown
g. Low coolant temperature alarm
h. Low battery voltage alarm
i. High battery voltage alarm
j. Control switch not in auto position alarm
k. Battery charger failure alarm
2. Generator Alarm/Shutdown
a. Generator phase sequence
b. Generator over voltage
c. Generator under voltage
d. Generator over frequency
e. Generator under frequency
f. Generator reverse power (real and reactive)
g. Generator overcurrent
3. Voltage Regulator Alarm/Shutdown
a. Loss of excitation alarm/shutdown
b. Instantaneous over excitation alarm/shutdown
c. Time over excitation alarm/shutdown
d. Rotating diode failure

F. Inputs and Outputs:
1. Programmable Digital Inputs: The Controller shall include the ability to accept programmable digital input signals. The signals may be programmed for either high or low activation using programmable Normally Open or Normally Closed contacts.
2. Programmable Relay Outputs: The control shall include the ability to operate programmable relay output signals, integral to the controller. The output relays shall be rated for 2A @ 30VDC and consist of six (6) Form A (Normally Open) contacts and two (2) Form C (Normally Open & Normally Closed) contacts.
3. Programmable Discrete Outputs: The control shall include the ability to operate two (2) discrete outputs, integral to the controller, which are capable of sinking up to 300mA.

G. Maintenance: All engine, voltage regulator, control panel and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set control:
1. Engine running hours display.
2. Service maintenance interval (running hours or calendar days).
3. Engine crank attempt counter.
4. Engine successful starts counter.
5. 40 events are stored in control panel memory.
6. Programmable cycle timer that starts and runs the generator for a predetermined time. The timer shall use 7 user-programmable sequences that are repeated in a 7-day cycle. Each sequence shall have the following programmable set points:
a. Day of week

b. Time of day to start
c. Duration of cycle

H. Remote Communications:
1. The control shall include Modbus RTU communications as standard via RS-485 half duplex with configurable baud rates from 2.4k to 57.6k.
2. Remote Monitoring Software: The control shall provide Monitoring Software with the following functionality.
a. Monitor up to eight (8) generator sets, plus ATS and UPS.
b. Provide access to all dates and events on generator set communications network.
c. Provide remote control capability for the generator set(s).
d. Ability to communicate via Modbus RTU or remote modem.

2.10 REMOTE ANNUNCIATOR

A. Provide a remote annunciator to meet the requirements of NFPA 99/110, Level 1.
1. Remote Annunciator shall include a lamp test pushbutton, alarm horn and alarm acknowledge pushbutton.
2. Provide the following individual light indications for protection and diagnostics.
a. Overcrank
b. Low coolant temperature
c. High coolant temperature warning
d. High coolant temperature shutdown
e. Low oil pressure warning
f. Low oil pressure shutdown
g. Overspeed
h. Low coolant level
i. EPS supplying load
j. Control switch not in auto
k. High battery voltage
l. Low battery voltage
m. Battery charger AC failure
n. Emergency stop
o. Spare
p. Spare
3. Ability to be located up to 4000 ft from the generator set.
4. Remote E-Stop: Provide a remote e-stop in a NEMA 1 enclosure with break-glass cover.
5. Remote annunciator panel shall be mounted where shown on the drawings.

2.11 TELEMATICS AND DATA MONITORING

A. There shall be a monitoring and data management system available on a 24/7/365 basis, which interfaces with the asset (generator set, switchgear, etc.) via a cellular or Ethernet connection.
1. The system shall monitor the asset continually.
a. It shall provide automated alert notification via text message and/or e-mail. These alerts shall also be displayed by a web-based system which will be updated automatically.
b. Asset functions being monitored will be displayed by a web-based system which will be updated automatically.
c. Asset monitoring allows for remote troubleshooting to upkeep asset health and performance.
2. Continual monitoring offers various status updates, including reports of an asset’s basic engine and electrical parameters and historical performance.

B. The web-based software shall be secure, requiring a registered user name and password structure for access.
   1. Data Privacy Principles of the remote monitoring system are as follows:
      a. The manufacturer shall be transparent about data collection
      b. The manufacturer shall protect the data collected
      c. The manufacturer shall respect the data rights of others

C. Subscription shall include the ability to remotely access equipment information with proactive equipment service and operation recommendations from a manufacturer's advisor.

D. The telematics hardware and remote monitoring user interface shall be an end-to-end system designed with multi-layer security controls and safeguards, to protect against unauthorized access and disclosure.
   1. High level security safeguards include, but not limited to:
      a. Cryptographic security controls to protect against unauthorized device software changes.
      b. Encrypted and authenticated remote connection.
      c. Only an outbound remote connection, initiated by the device, is allowed. Device shall not participate in or respond to general internet traffic.
      d. Manufacturer's corporate IT infrastructure secured utilizing generally accepted information security principles and practices.
      e. Secure web application connection with user login authentication and role-based access controls.
   2. Security Principles of the remote monitoring system shall be as follows:
      a. Dedicated cybersecurity program and team
      b. Risk-based approach to multi-layers cybersecurity
      c. Proactively about cybersecurity
      d. Response and Remediation to Cyber incidence
      e. Training and awareness

E. The system will offer the user the option of having alarms and/or events handled by an expert advisor trained by the manufacturer. The advisor shall follow a user-defined procedure for handling alarms and/or events.

PART 3 - EXECUTION

3.01 PROJECT SPECIFIC FACTORY EQUIPMENT TESTS

A. Before shipment, factory test engine-generator set, and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
   1. Full load run.
   2. Maximum power.
   3. Voltage regulation.
   4. Transient and steady-state governing.
   5. Single-step load pickup.
   6. Safety shutdown.

3.02 INSTALLATION REQUIREMENTS

A. Entire unit shall be installed in accordance with manufacturers' recommendations.

B. Mounting: Complete engine/generator and all mounted accessories shall be assembled on a common channel steel base. Fuel oil lines and lube oil drain shall terminate in base. Lube oil drain line shall be brought out to beyond the base to facilitate changing of the oil. Flexible fuel line sections (18" long) to be installed between base and fuel lines. Heavy-duty, steel spring

vibration isolators shall be installed between the base and mounting pad. Isolators shall be sized and located as recommended by Generator Manufacturer.

C. Contractor shall provide the services of a factory-trained engineer for periodic job site visits during installation to ensure that the system is being installed in accordance with manufacturers' recommendations.

D. Complete engine/generator system shall be tested after installation to ensure that the engine/generator, automatic transfer switch, alarm annunciators, and all other equipment function in accordance with the specifications.

E. After installation, a 4-hour full load test shall be conducted by the distributor's engineer. This test shall be conducted using available building load, plus temporary load bank capacity so that full nameplate reading is utilized during test. Temporary load banks shall be furnished by the generator distributor and connected by Division 26 contractor. Test data shall be recorded and become a part of the three (3) Owners Manuals to be supplied.

F. After Owner acceptance, Factory Representative shall provide a minimum of one (1) day of Owner training in the complete operation and maintenance of the automatic transfer switch system and generator system. The training session for the automatic transfer switch system and generator system shall be scheduled on a separate day from the startup and testing day and shall be scheduled at least two weeks in advance with the Owner and before building acceptance.

G. Ground the engine generator frame and enclosure using an equipment grounding conductor sized in accordance with the NEC. Ground generator neutral on 4-pole (switched neutral) applications.

END OF SECTION 26 32 13

SECTION 26 36 00
AUTOMATIC TRANSFER SWITCH

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide automatic transfer switch(es) as shown on the drawings.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide automatic transfer switch as manufactured by ASCO, Kohler, Zenith, Russelectric, or approved substitute.

2.02 EQUIPMENT

A. Switch shall be UL listed and CSA certified. It shall meet the voltage impulse withstand test in accordance with the proposed NEMA Standard ICS-109.21 and voltage surge withstand capability in accordance with ANSI C37.90A/IEEE 472. Switch(es) shall have ampere rating and voltage rating as shown on drawings.

B. Transfer switch(es) to be in NEMA-1 wall-mounted enclosures unless otherwise indicated. All control relays to be accessible from front of enclosure for maintenance and repair. Transfer mechanism to be electrically operated, mechanically held. Failure of the emergency source shall result in retransfer to the normal source. The transfer switch to be equipped with a manual operator to allow for manual transfer.

C. Engine starting contacts to be provided to start engine, should the voltage of the normal source drop below the preset value, after a time delay of 1-3 seconds to allow for momentary dips.

D. After restoration of normal power, transfer switch shall remain in emergency position for an adjustable period of 0-30 minutes (set for 15 minutes unless directed otherwise). After retransfer to normal, engine/generator to continue to run for an adjustable period of 0-20 minutes to allow for cool down. A voltage/frequency relay to be provided to prevent transfer to the emergency source until operating level is attained.

E. In addition to position indicating lamps, auxiliary contacts to be provided (one normally open, one normally closed).

F. Provide test switch to simulate a power failure, under load conditions.

G. Provide an automatic exerciser to operate the unit for a period of 30 minutes every 168 hours. During exercise period, transfer switch(es) shall not transfer to the emergency source.

H. Transfer switches used with ground-fault equipment, 4-wire systems to be 4-pole switched neutral or 3-pole with overlapping neutral contacts.

I. Switch(es) to be double throw actuated by a single operator, momentarily energized. Main contacts may be replaced without major disassembly. Transfer switch(es) with magnetic blow outs to be provided on each pole.

J. Normal voltage sensing to be on 3-phase with pick-up at 95 percent and drop-out at 90 percent of normal voltage.

K. Interlocked molded case circuit breakers, contactors or transfer devices with dual solenoid operators are not acceptable.

L. ATS shall be equipped with a transparent protective cover allowing visual inspection of contacts while inhibiting inadvertent contact with energized components.

M. Provide all wiring and raceways as required for elevator pre-signal and controls as required by elevator manufacturer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Switch shall be installed as shown on the drawing complete with all controls for engine starting and transfer.

END OF SECTION 26 3600

SECTION 26 43 00
SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide 3-phase, 4-wire Surge Protective Devices (SPDs) at the main service as

1.02 RELATED WORK

A. Section 26 2416 - Panelboards.

B. Section 26 2413 - Circuit Breaker Distribution Switchboard

C. Section 26 0526 – Grounding and Bounding for Electrical Systems.

1.03 STANDARDS

A. UL compliance: Listed to UL 1449 4th Edition by an OSHA approved Nationally Recognized Test Lab (NRTL)

B. ANSI/IEEE compliance: Comply with ANSI/IEEE C62.1, C62.41, and C62.45 test procedures.

C. National Electric Code - Section 280 and 285.

D. UL96A, Para. 13.1

1.04 SUBMITTALS

A. Submit product data and shop drawings as required by Section 26 0100.

B. Submittals shall include the following:
   1. Complete manufacturers' data for each suppressor indicating part numbers and rated voltages and currents.
   2. Product performance analysis with graphic display of let-thru waveforms and peak clamping voltages for ANSI C62.41 tests, Categories A3 & B3 ringwaves and C1 & C3 impulses.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. SPDs shall be as manufactured by Current Technology, EFI Corporation, Liebert, or approved equal.

B. The suppressor manufacturer shall offer factory repair service for all units, which will include replacement for non-repairable sealed units.

2.02 WARRANTY

A. SPD devices shall be warranted for a minimum of 10 years.

2.03 SPECIFICATIONS

A. General:
   1. SPD shall be internally fused, capable of allowing the suppressor's maximum rated transient current to pass through the suppressor without fuse operation. SPD shall be listed as a Type1 SPD without the need for upstream over current protection for safe operation.

2. Proper operation of the suppressor elements on each phase shall be indicated by a normally-on LED or lamp. Also, normally closed contacts shall be used for remote annunciation of suppressor failure.
3. The SPD shall be compatible with the electrical system voltage, current, and distribution configuration.
4. The SPD maximum continuous operating voltage shall be 115% of the nominal RMS voltage with no degradation. The MCOV value shall be a tested value as outlined in UL1449 3rd Edition section 37 .7.3. The MCOV shall not be a claimed value based solely on the MCOV of the surge component used in the design, nor based solely on the 115% over voltage test outlined in UL1449.
5. The SPD shall be sine-wave tracking to provide added protection against oscillatory transients, such as Category A and B Ringwaves.
6. Failure of the SPD shall not cause any disruption of power.

B. Service Entrance SPD Devices:
1. The SPD shall have a surge current capacity of 100,000 amps (8 x 20 microsec) minimum per mode.
2. SPD devices shall meet or exceed the following operating characteristics and ratings: (Series Ratings)
3. The SPD shall be a Type1 listed SPD per UL1449 3rd Edition.
4. The SPD shall meet the requirements of UL96A, Para. 13.1
5. The unit shall not have more than 10% deterioration or degradation of the UL1449, 3rd Edition Voltage Protection Rating (VPR) due to repeated surges. Acceptable clamping values are shown below based on test procedures outlined in UL1449 3rd Edition.

System Voltage	Mode	MCOV	B3 Ringwave	C3 Comb. Wave	UL 1449 Second Edition SVR Rating	UL 1449 Third Edition VPR Rating
120/240 120/208	L-N	150	325/375	650/775	400/400	700/700
	L-G	150	400/450	650/825	500/500	700/700
	N-G	0	350/350	500/500	500/500	900/1000
	L-L	300	400/500	950/1250	700/700	900/1000
277/480	L-N	320	550/600	1125/1225	800/800	900/1000
	L-G	320	850/875	1075/1225	1000/1000	1200/1200
	N-G	0	700/700	900/900	900/900	1200/1500
	L-L	550	650/750	1950/2200	1500/1500	1800/1800

C. Distribution Panel SPD Devices:
1. The SPD shall have a surge current capacity of 60,000 amps (8 x 20 microsec) minimum per mode.
2. SPD devices shall meet or exceed the following operating characteristics and ratings: (Series Ratings)
3. The SPD shall be a Type1 or Type2 SPD per UL1449 3rd Edition.

4. The unit shall not have more than 10% deterioration or degradation of the UL1449, 3rd Edition Voltage Protection Rating (VPR) due to repeated surges. Acceptable clamping values are shown below based on test procedures outlined in UL1449 3rd Edition.

System Voltage	Mode	B3 Ringwave	B3/C1 Comb. Wave	C3 Comb. Wave	UL 1449 Second Edition SVR Rating	UL 1449 Third Edition VPR Rating
120/240	L-N	420	642	1040	400	800
120/208	L-G	480	690	1300	400	800
	N-G	340	620	1240	400	800
	L-L	610	1010	1420	700	1200
277/480	L-N	660	910	1490	700	1200
	L-G	750	1068	1830	800	1200
	N-G	720	974	1690	800	1200
	L-L	960	1700	2290	1500	1800

PART 3 - EXECUTION

3.01 INSTALLATION

A. Mount all 3-phase SPD devices in a separate cabinet attached to the panelboard it serves. The SPD shall not be internally mounted to the power or distribution panelboard. Cabinets for devices serving large service entrance main switchboards shall be located in a section of the switchboard where this option is made available by the manufacturer or be externally mounted to the switchboard. Cabinets for devices serving flush-mounted panelboards shall also be suitable for flush mounting. Cabinets shall comply with Section 26 2716 of the specifications.

B. Ground the SPDs and cabinets in accordance with the manufacturer's instructions, the National Electrical Code (section 280 and 285), and wiring diagrams shown on the drawings.

C. Provide wiring to the remote monitor(s) in accordance with the manufacturer's instruction and as shown on the drawings.

D. The SPD shall not include multiple replacement modules.

E. All conductors associated with SPDs shall be installed in conduit. Minimum conductor size shall be #8 AWG copper. Conductors shall be as short and as straight as possible with no unnecessary length or turns. A maximum length of 12 inches is required where possible.

F. SPDs shall be connected in parallel with main conductors. Service entrance SPDs shall incorporate the use of an internally mounted disconnect. Panelboard surge protectors shall be installed behind a minimum 60 amp overcurrent/disconnecting device. Where 12 inches of lead length is not possible utilization of a low impedance preassembled cable assembly is required to lower the clamping voltages of the installed system to acceptable levels. Lead length must include phase connection plus neutral or ground.

G. Mounting position of the SPD and overcurrent protection device shall be coordinated to minimize the total phase, neutral and ground cable lengths to achieve minimum installed system clamping voltages.

END OF SECTION 26 4300

SECTION 26 51 00
INTERIOR LIGHTING AND LAMPS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide labor, material, equipment and services necessary to provide all interior lighting fixtures, necessary hangers and lamps. Fixtures include all interior fixtures plus all exterior fixtures mounted to exterior wall or to structures connected directly to building.

1.02 SUBMITTALS

A. Submit for approval prior to purchasing fixtures complete fixture lists of fixtures proposed to be used. Include cuts of both specified fixture and proposed equivalent fixtures if fixtures other than those specified are submitted.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Provide lighting fixtures indicated by type on lighting fixture schedule on drawings.

2.02 EQUIPMENT REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Standards:
   1. ENERGY STAR certified.
   2. California Title 24 compliant.
   3. NRTL Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by an NRTL.
   4. FM Global Compliance: Luminaires for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.
   5. UL Listing: Listed for damp location.
   6. Recessed luminaires shall comply with NEMA LE 4.
   7. User Replaceable Lamps:
      a. Bulb shape complying with ANSI C78.79.
      b. Lamp base complying with ANSI C81.61.

C. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

D. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.

E. Provide luminaires from a single manufacturer for each luminaire type.

F. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

G. Rated lamp life of 50,000 hours to L70.

H. Lamps dimmable from 100 percent to 0 percent of maximum light output.

I. Internal driver.

PART 3 - EXECUTION

3.01 INSTALLATION REQUIREMENTS

A. Comply with NECA1.

B. Fixtures shall be securely mounted as required by Section 410, NEC and as specified herein.

C. Fixtures mounted in a suspended ceiling shall be secured to the grid with approved clips as required by the NEC.

D. Fixtures shall be mounted in locations as shown on architectural reflected ceiling drawings.

E. Mount fixtures as called for in schedule on electrical drawings. Determine type of ceiling to be installed in each space from architectural drawings and schedules and furnish fixtures suitable for the exact type.

F. Receive, store, uncrate, and install lighting fixtures shown in schedule on drawings to be furnished by others.

G. Recessed fixtures in dropped ceiling areas shall be connected using Greenfield and No. 14 THHN wire. Greenfield shall be connected to fixture and outlet box. Each piece of Greenfield shall include in it a separate insulated green grounding conductor not smaller than No. 14 AWG for grounding continuity between fixture and conduit system. Grounding conductor shall be mechanically connected in a permanent and effective manner to fixture and conduit system and shall be electrical continuous. No conduit shall enter a recessed fixture directly as this would prevent removal of fixture without disturbing balance of circuit.

H. Joints in fixture wiring shall be made using wire nuts, preinsulated Scotch locks, Ideal No. 30-410 crimps and No. 30-415 wrap caps, or other approved mechanical means of connection.

I. Adjustable type fixtures shall be adjusted by the Contractor to illuminate intended area to satisfaction of Owner.

J. Any adjustable outside area lights or lights mounted on building shall be adjusted at night by the contractor to satisfaction of Owner.

K. Recessed fixtures installed in exposed or concealed tee bar ceilings may not use ceiling grid to support fixtures. Fixtures shall be securely fastened to ceiling framework per NEC Article 410, and shall be supported as described in seismic detail.

L. Surface or recessed fixtures in or on plastered or drywall ceilings shall be supported in accordance with seismic fixture mounting details and shall not depend on ceilings for support.

M. Support fixtures in seismic zones per detail on drawings.

N. All light fixtures shall be grounded in accordance with the NEC. Any fixtures suspended from ceiling which do not include a separate ground wire shall be grounded in a method approved by section 250 of the NEC. Where the conduit is utilized as the ground with a hook pendant style mounting system, a separate ground conductor shall be bonded to the conduit where the conduit ceases to be continuous and routed to the fixture.

END OF SECTION 26 5100

SECTION 26 56 00
EXTERIOR LIGHTING AND LAMPS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide labor, materials, equipment and services necessary for installation of all exterior lighting fixtures, lamps, poles, pole bases etc. for:
   1. Flood lighting.
   2. Parking lot and access roads.
   3. Walkways and exterior building lights.

B. Refer to details and arrangements shown on drawings.

C. Provide concrete bases as required for type of arrangements indicated.

D. Concrete bases as required for type of arrangements indicated shall be installed under Division 03. Coordinate with other divisions for proper size of bases, anchor bolt arrangements, conduit stub-ups to pole bases, etc. Provide concrete bases as required for type of arrangements indicated on seismic detail on mechanical drawings.

E. Fixtures, poles, and appurtenances, shall be suitable for exterior use, shall be UL listed, and shall be of standard design for intended application.

1.02 SUBMITTALS

A. Submit for approval prior to purchasing fixtures complete shop drawings and brochures including photometrics for each type of exterior lighting system specified. Shop drawings and brochures shall be specific and shall include all pertinent data and accessories. If substitute fixtures are proposed, include cuts of both specified fixture and proposed equivalent fixtures including photometrics of both fixtures.

B. If requested by Architect, submit a sample fixture which will be returned after inspection by Architect.

C. Architect reserves right to accept any fixture as an approved equivalent.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Lighting fixtures as indicated on Lighting Fixture Schedule.

B. Contactors and selector switches shall be Square D or approved substitute.

C. Photocells: Tork.

D. Lighting Contactors: Square D or approved substitute.

2.02 MATERIALS

A. Provide luminaire and pole assemblies as scheduled.

B. Luminaires, including all components, shall be designed to meet extreme temperature (low), moisture, and wind conditions in area.

C. Poles: Steel round or square, designed for wind load in the area of installation.

D. All 150-1500 watt metal halide luminaires shall be equipped with a proper ballast that is in compliance with the minimum requirements of the Energy Independence and Security Act of 2007 (EISA of 2007). Luminaires shall be marked with the circle E symbol indicating compliance with EISA.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install parking lot/roadway luminaires and poles on concrete bases. Provide all anchor bolts and bolt hole circle templates. Adjust luminaires to correct tilt and lamp all fixtures.

B. Adjust or rotate area and roadway lighting at night to maximize light utilization in intended areas.

C. Install large area luminaires and poles on concrete bases. Provide all anchor bolts and bolt hole circle templates. Adjust luminaires to correct tilt and lamp all fixtures.

D. Contractor to adjust or rotate area and roadway lighting at night to maximize light utilization in intended areas.

E. Bond together ground connections of luminaires to equipment grounding conductor, pole, and if present, separate 3/4" diameter x 10' copperweld ground rod driven at base of each pole.

F. Ground all luminaires to poles and all poles to equipment grounding conductor or to separate 3/4" diameter x 10' copperweld ground rod driven at base of each pole.

G. Each pole mounted outside lighting luminaire shall have its conductors spliced to the branch circuit connectors in the pole base. Provide a Tron waterproof fuse holder with time delay fuse (1.5 X luminaire current) in the pole base for each ungrounded conductor for each luminaire.

END OF SECTION 26 5600

SECTION 26 70 00
CONNECTION TO OWNER FURNISHED EQUIPMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Owner-furnished equipment such as Kitchen Equipment, Dental Equipment, Fitness Equipment, etc, shall be connected by this Contractor in accordance with manufacturers brochures and instructions.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Conduit, wire, outlet boxes, disconnect switches, etc. to be provided and installed by this contractor to conform with applicable section of these specifications.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Electrical equipment as noted above shall be assembled, installed, and connected by this Electrical Contractor.

B. All equipment to be connected and left in satisfactory operating condition by the Contractor.

END OF SECTION 26 7000

SECTION 27 37 00
LOW VOLTAGE ROUGH-IN SPECIFICATIONS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. All work specified in this section shall comply with the provisions of Division 26 or 27.

B. All conduit rough-in and outlet boxes for all low voltage systems/communications shall be provided and installed by Electrical Contractor.

C. All device locations will be as shown on communications systems drawings. Refer to system details for height requirements.

1.02 RELATED WORK

A. Raceways: Sections 260534.

B. Supporting Devices and Hangers: Section 26 0529.

C. Pull and Junction Boxes: Section 26 0538.

D. Outlet Boxes: Section 26 0537.

PART 2 - PRODUCTS

2.01 EQUIPMENT

A. All low voltage conduits shall be 1” EMT stubbed to nearest accessible ceiling unless otherwise noted in these specifications or drawings. Conduit shall be terminated with nylon bushing.

B. Contractor to provide standard outlet boxes to conform to "OUTLET BOX" section of these specifications and sized as shown on drawings.

C. The Electrical Contractor is responsible for all hangers, straps, and support structure necessary to properly hang/support conduit.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The General contractor will schedule the installation of the conduit systems.

B. The Electrical Contractor will receive, store and protect all rough-in equipment.

C. The Electrical Contractor shall use building lines or 90° angles when installing conduit.

D. The Electrical Contractor shall work with others trades to coordinate location and installation of bracing for TV brackets.

E. For structured voice and data cabling infrastructure, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, terminations and miscellaneous hardware required for a complete system is to be provided and installed.

F. For television cable system, background music/paging system, intercom system and nurse call/code blue system, the Electrical Contractor is to provide all rough-in, sleeves, fire stopping and standard outlet boxes. The Communications Contractor is to provide and install all cable, low voltage relays, and special backboxes. All equipment, devices, and miscellaneous hardware required for a complete system is to be provided and installed by the respective Owner/Vendor.

G. Where open cable is run above dropped ceilings and penetrates a smoke or fire rated wall, this contractor shall furnish and install a minimum 1" (unless otherwise noted) empty sleeve, 5' long, extending at least 2' on both sides of the partitions with bushings on both ends. In areas in which penetrations larger than 1” are required, the communications contactor shall install Specified Technologies EZ Path product or approved equivalent.

H. All cable concealed in walls or inaccessible (drywall) ceilings shall be installed in conduit.

END OF SECTION 27 3700

SECTION 28 31 00
FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 SCOPE AND RELATED DOCUMENTS

A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations associated with the installation of the fire alarm system as shown on the drawings and as herein specified.

B. The requirements of the conditions of the Contract, Supplementary Conditions, and General Requirements apply to the work specified in this section.

C. The complete installation shall conform to the applicable sections of NFPA-72, local code requirements, and National Electrical Code with particular attention to Article 760.

D. The work covered by this section of the specifications shall be coordinated with the related work as specified elsewhere under the project specifications.

1.02 QUALITY ASSURANCE

A. Each and all items of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the UL label. All control equipment shall be listed under UL category UOJZ as a single control unit. Partial listing shall not be acceptable.

B. All control equipment must have transient protection to comply with UL864 requirements.

C. Where fire alarm circuits leave the building, additional transient protection must be provided for each circuit. Devices must be UL listed under Standard 497B, Isolated Loop Circuit Protectors.

D. In addition to the UL-UOJZ requirement mentioned above, the system controls shall be UL listed for power limited applications and all circuits must be marked in accordance with NEC Article 760-23.

1.03 GENERAL

A. Furnish and install a complete fire alarm system as described herein and as shown on the plans, to be wired, connected, and left in first class operating condition. Include sufficient control panel(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, alarm indicating appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

1. The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
2. Full flexibility for selective input/output control functions based on anding, oring, noting, timing, and special coded operations shall also be incorporated in the resident software programming of the system.

B. Resident software shall allow for full configuration of initiating circuits so that additional hardware shall not be necessary to accommodate changes in, for instance, sensing of normally open contact devices to sensing of normally closed contact devices, or from sensing of normally open contact devices to sensing a combination of current limited and non-current limited devices on the same circuit and being able to differentiate between the two, or changing from a non-verification circuit to a verification circuit or vice-versa.

C. Resident software shall also allow for configuration of indicating appliance and control circuits so that additional hardware shall not be necessary to accommodate changes in, for instance, changing a non-coded indicating appliance circuit to a coded circuit, or from a slow march time (20 BPM) to a fast march time (120 BPM).

D. The system shall have the capability of recalling alarms and trouble conditions in chronological order for the purpose of recreating an event history.

E. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component. The catalog numbers specified under this section are those of Simplex Time Recorder Company and constitute the type, product quality, material, and desired operating features.

F. If equipment of another manufacturer is submitted for approval, the contractor shall state how much is to be deducted from his base bid for the substitution, and also shall state what, if any, specific points of system operation differ from the specified points of the system operation. This differentiation report must reference every paragraph of this specification.

1.04 OPERATION

A. The system alarm operation subsequent to the alarm activation of any manual station, automatic detection device, or sprinkler flow switch shall be as follows:
   1. All audible alarm indicating appliances shall:
      a. Sound a continuous fire alarm signal until silenced by the alarm silence switch at the control panel
      b. Sound a selective positive non-interfering successive zone code. Interference of this code shall not be permitted until a completed transmission of its assigned number of rounds. Should coding be completed, a continuous master code or march time pattern shall sound until silenced by the alarm silence switch at the control panel.
      c. Sound a march time pattern until silenced by the alarm silence switch at the control panel.
      d. Sound a master code until silenced by the alarm silence switch at the control panel. The master code will consist of a common code, e.g., 4-4-4.
   2. All visible alarm indicating appliances shall flash continuously until the alarm silence switch is operated.
   3. Alarm indicating appliances shall operate selectively by floor
   4. The audible alarms shall be automatically silenced after 90 minutes of alarm operation.
   5. The audible alarms shall be inhibited from being silenced for a period of 5 minute(s) after commencing operation.
   6. Any subsequent zone alarm shall reactivate the alarm indicating appliances.
   7. All doors normally held open by door control devices shall release after a 10 second time delay.
   8. A supervised signal to notify the local fire department shall be activated.
   9. The mechanical controls shall activate the air handling systems in accordance with NFPA 90.

B. The control panel shall provide "ON/OFF/AUTO" switches. In the automatic mode, the mechanical controls shall operate the air handling systems as required normally. The control panel shall indicate "ON" or "OFF" status of the air handling system via separate and distinct "ON" and "OFF" LED indicators. Manual control shall be provided to override the automatic function.
   1. A "positive feedback" input shall be provided to indicate true "ON" or "OFF" status from a contact closure of the air handling system. This positive feedback indication shall take precedence in determining true ON/OFF status.
   2. Supervised "positive feedback" inputs shall be provided to indicate true "ON" and "OFF" status from designated contact closures in the air handling system. This positive feedback indication shall take precedence in determining true "ON/OFF" status.

C. Upon reset of the fire alarm control panel, air handling units shall sequentially start up to minimize power demand.

D. The alarm shall be displayed on an 80 character LCD display. The top line of 40 characters shall be the point label and the second line shall be the device type identifier. The system alarm LED shall flash on the control panel and the remote annunciator until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone shall flash the system alarm LED on the control panel and remote annunciator. The LCD display shall show the new alarm information.

E. A pulsing alarm tone shall occur within the control panel and the remote annunciator until the event has been acknowledged.

F. The alarm activation of any elevator lobby smoke detector shall, in addition to the operations listed above, cause the elevator cabs to be recalled according to the following sequence:
   1. If the alarmed detector is on any floor other than the main level of egress, the elevator cabs shall be recalled to the main level of egress.
   2. If the alarmed detector is on the main egress level, the elevator cabs shall be recalled to the predetermined alternate recall level as determined by the local authority having jurisdiction.

G. The activation of any system smoke detector shall initiate an alarm verification operation whereby the panel will reset the activated detector and wait for a second alarm activation. If, within one (1) minute after resetting, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm as described previously. If no second alarm occurs within one minute, the system shall resume normal operation. The alarm verification shall operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately. The alarm verification operation shall be selectable by zone.
   1. The control panel shall have the capability to display the number of times (tally) a zone has gone into a verification mode. Should this smoke verification tally reach a pre-programmed number, a trouble condition shall occur.
   2. Alarm verification zones shall be able to be divided into eight separate groups whereby only verification zones from the same group will confirm the first activation and cause the alarm sequence to occur.

H. The control panel shall have a dedicated supervisory service LED and a dedicated supervisory service acknowledge switch.
   1. The activation of any standpipe or sprinkler valve supervisory (tamper) switch shall activate the system supervisory service audible signal and illuminate the LED at the control panel and the remote annunciator. Differentiation between valve tamper activation and opens and/or grounds on the initiation circuit wiring shall be provided.
   2. Pressing the supervisory service acknowledge key will silence the supervisory audible signal while maintaining the supervisory service LED "ON" indicating the off-normal condition.
   3. Restoring the valve to the normal position shall cause the supervisory service LED to extinguish, indicating restoration to normal.
   4. Restoring the valve to the normal position shall cause the supervisory service audible signal to pulse indicating the restoration to normal position. The supervisory service acknowledge key shall silence the audible signal.

I. The alarm activation by either a manual or an electrically-operated coded station shall pulse the alarm indicating appliance to follow that code. The coded input signal shall take priority over all other input signals. All other alarm inputs shall be processed accordingly after coding is completed. If PNIS code is interrupted, it must be restarted and completed in its entirety without missing any portion of the code. Activation of control circuits for door release and air handling system shall not be delayed.

J. A manual evacuation (drill) switch shall be provided to operate the alarm indicating appliances without causing other control circuits to be activated. However, should a true alarm occur, all alarm functions would occur as described previously.

K. Activation of an auxiliary bypass switch shall override the selected automatic functions.

L. The system shall have a single key that will allow the operator to display all alarms, troubles, and supervisory service conditions including the time of each occurrence.

M. A voltmeter and ammeter shall be provided to indicate battery voltage and charging current.

N. All doors normally held open by door control devices shall release upon AC power failure.

O. The actuation of the "enable walk test" program at the control panel shall activate the "walk test" mode of the system which shall cause the following to occur:
   1. The city circuit connection shall be bypassed.
   2. Control relay functions shall be bypassed.
   3. The control panel shall show a trouble condition.
   4. The alarm activation of any initiation device shall cause the audible signals to activate for two seconds.] [The alarm activation of any initiation device shall cause the audible signals to code a number of pulses to match the zone number.
   5. The panel shall automatically reset itself after signaling is complete.
   6. Any momentary opening of an initiating or indicating appliance circuit wiring shall cause the audible signals to sound for four seconds indicating a trouble condition.
   7. The system shall have the capacity of eight distinctive walk test groups. Such that only a portion of the system need be disabled during testing.

1.05 SUPERVISION

A. The system shall contain Class "B", Style "B" supervised initiating device circuits. The alarm activation of any initiation circuit shall not prevent the subsequent alarm operation of any other initiation circuit.

B. There shall be supervisory service initiation device circuits for connection of all sprinkler valve supervisory (tamper). Device activation shall cause a supervisory alarm at the control panel.

C. There shall be 1 independently supervised and independently fused indicating appliance circuits for alarm horns. Disarrangement conditions of any circuit shall not affect the operation of other circuits.

D. Auxiliary manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble.

E. Each independently supervised circuit shall include a discrete LCD readout to indicate disarrangement conditions per circuit.

F. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.

G. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and the remote annunciator.

H. The system modules shall be electrically supervised for module placement. Should a module become disconnected, the system trouble indicator shall illuminate and the audible trouble signal shall sound.

I. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

J. Wiring to a hardwired (non-serial) remote annunciator shall be supervised for open and ground conditions. A separate annunciator trouble LCD readout must be provided. It shall illuminate and an audible trouble signal shall sound at the control panel upon the detection of an open or ground condition.

K. There shall be independent supervision for opens of the air handling on/off/auto switch control output wiring. A discrete trouble LCD readout per output circuit will be provided for indication.

A ground condition of the air handling control output wiring shall indicate a common ground trouble on the control panel.

1.06 POWER REQUIREMENTS

A. The control panel shall receive 120 VAC power (as noted on the plans) via a dedicated fused disconnect circuit.

B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of four (4) hours with 90 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

C. All external circuits requiring system operating power shall be 24 VDC and shall be individually fused at the control panel.

PART 2 - PRODUCTS

2.01 FIRE ALARM CONTROL PANEL - SIMPLEX TYPE 4100-8001

A. Control panel construction shall be modular with solid-state, microprocessor-based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions.
   1. A local audible device shall sound during alarm, trouble, or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly.

B. The following primary controls shall be visible through a front access panel:
   1. Eighty character liquid crystal display.
   2. Individual red system alarm LED.
   3. Individual yellow supervisory service LED.
   4. Individual yellow trouble LED.
   5. Green "power on" LED.
   6. Alarm Acknowledge key.
   7. Supervisory Acknowledge key.
   8. Trouble Acknowledge key.
   9. Alarm Silence key.
   10. System Reset key.

C. The following secondary control switches and LEDs shall be available behind an access door:
   1. City disconnect/switch.
   2. Manual evacuation (drill).
   3. Elevator bypass.
   4. Door holder release bypass.
   5. Future.

D. The control panel shall provide the following:
   1. Setting of time and date.
   2. LED testing.
   3. Alarm, Trouble, and Abnormal condition listing.
   4. Enabling and disabling of each monitor point separately.
   5. Activation and deactivation of each control point separately.
   6. Changing operator access levels.
   7. Walk Test enable.

8. Running diagnostic functions.
9. Displaying software revision level.
10. Displaying historical logs.
11. Displaying card status.
12. Point listing.

E. For maintenance purposes, the following lists shall be available from the point lists menu:
1. All points list by address.
2. Monitor point list.
3. Signal/speaker list.
4. Auxiliary control list.
5. Feedback point list.
6. Psuedo point list.
7. LED/switch status list.

F. Scrolling through menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user. These controls shall be located behind an access door.

G. Primary Keys, LEDs, and LCD Display:
1. The control panel shall have a 2 line x 40 character liquid crystal display which shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.
2. The display shall support both upper and lower case letters. Lowercase letters shall be used for softkey titles and prompting the user. Uppercase letters shall be used for system status information. A cursor shall be visible when entering information.

2.02 SYSTEM FRONT PANEL OPERATION AND CAPABILITIES

A. Under normal condition, the front panel shall display a "System is Normal" message and the current time and date.

B. Should an abnormal condition be detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

C. The LCD shall display the following information relative to the abnormal condition of a point in the system.
1. 40 character custom location label.
2. Type of device (i.e., smoke, pull station, water flow).
3. Point status (i.e., alarm, trouble).

D. Two methods of acknowledgment for each abnormal condition shall be provided. One may be chosen depending on the NFPA requirements.
1. For NFPA 72D requirements: Pressing the appropriate acknowledge button shall display the first unacknowledged condition in the appropriate list (either alarm, supervisory, or trouble), and require another acknowledge button. Press to acknowledge only the displayed point.
2. For NFPA 72A, B, or C requirements: Pressing the appropriate acknowledge button shall globally acknowledge every point in the list.

E. These acknowledge functions may be passcode protected if the user has insufficient privilege to acknowledge such conditions. A message shall indicate insufficient privilege but allow the user to view the points without acknowledging them. Should the user have sufficient privilege to acknowledge, a message will be displayed informing the user that the condition has been acknowledged.

F. After all points have been acknowledged, the LEDs shall glow steady and the Sonalert will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed

along with a prompt to review each list chronologically. The end of the list shall be indicated by an end-of-list message "END OF LIST."

G. Alarm Silencing:
   1. Should the Alarm Silence button be pressed, all audible alarm signals shall cease to operate.
   2. Signals shall not be silenced during alarm silence inhibit mode.

H. System Reset:
   1. The System Reset button shall be used to return the system to its normal state after an alarm condition has been remedied. The LCD display shall step the user through the reset process with simple English Language messages. Messages "SYSTEM RESET IN PROGRESS" will first be displayed followed by the message "SYSTEM RESET COMPLETED" and finally "SYSTEM IS NORMAL" should all alarm conditions be cleared.
   2. Should an alarm condition continue to exist the message "SYSTEM RESET IN PROGRESS" will be followed by the message "SYSTEM RESET ABORTED" and the system will remain in an abnormal state. System control relays shall not reset. The Sonalert and the alarm LED will be on. The display will indicate the total number of alarms and troubles present in the system along with a prompt to use the ACK keys to review the points. These points will not require acknowledgment, if they were previously acknowledged.
   3. Should the Alarm Silence Inhibit function be active, the SYSTEM RESET key press will be ignored. The message "SYSTEM RESET INHIBITED" will be displayed for a short time to indicate the action was not taken. As feedback to the operator, the message "SYSTEM RESET NO LONGER INHIBITED" will be displayed when the inhibit function times out.

I. Function Keys:
   1. Additional function keys shall be provided to access status data for the following points:
      a. Initiating device circuits.
      b. Indicating appliance circuits.
      c. Auxiliary relays.
      d. Feedback points.
      e. All other input/output points.
   2. The following status data shall be available.
      a. Primary state of point.
      b. Zone, PID and Card type information.
      c. Class "A" status.
      d. Current priority of outputs.
      e. Disable/Enable status.
      f. Verification tallies of initiating devices.
      g. Automatic/Manual Control Status of output points.
      h. Acknowledge status.
      i. Relay status.

J. History Logging:
   1. The system shall be capable of logging and storing 300 events in an alarm log and 300 events in a trouble log. These events shall be stored in a battery-protected random access memory. Each recorded event shall include the time and date of that event's occurrence.
   2. The following Historical Alarm log events shall be stored:
      a. Alarms.
      b. Alarm Acknowledgment.
      c. Alarm Silence.
      d. System Reset.
      e. Alarm Historical log cleared.
   3. The following Historical Trouble log events shall be stored:
      a. Trouble conditions.

b. Supervisory alarms.
c. Trouble acknowledgment.
d. Supervisory acknowledgment.
e. Alarm Verification tallies.
f. Walk Test results.
g. Trouble Historical log cleared.

4. Silent Walk Test with History Logging:
   a. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.
   b. The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.
   c. Should the walk test feature be on for an inappropriate amount of time, it shall revert to the normal mode automatically.
   d. The control panel shall be capable of supporting up to 8 separate testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation. After testing is considered complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.
   e. Should an alarm condition occur from an active point, not in walk test mode, it shall perform operations described in Section 1.4.

K. LED Supervision: All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the LCD shall display the module and LED location numbers to facilitate location of that LED.

L. System Trouble Reminder: Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmed to suit the owner's application.

M. Access Levels:
   1. There shall be four (4) access levels with level 4 being the highest level. Level 1 actions shall not require a passcode. Passcodes shall consist of up to ten (10) digits. Changes to passcodes shall only be made by authorized personnel.
   2. In order to maintain security when entering a passcode, the digits entered will not be displayed, but a cursor will move along filling the position with an X to indicate that the digit has been accepted. All key presses will be acknowledged by a local audible sound.
   3. When a correct passcode is entered, the message "Access Granted" shall be displayed. The new access level shall be in effect until the operator manually logs out or the keypad has been inactive for ten (10) minutes.
   4. Should an invalid code be inputted, the operator shall be notified with the message "ERROR...INCORRECT PASSCODE" and shall be allowed up to three chances to enter a valid code. After three unsuccessful tries, the message "ACCESS DENIED" shall be displayed. The level shall not be altered, and the operator shall no longer be in the menu option.
   5. Access to a level will only allow the operator to perform all actions within that level plus all actions of lower levels, not higher levels.
   6. The following keys/switches shall have access levels associated with them:
      a. Alarm Silence
      b. System Reset
      c. Set Time/Date
      d. Manual Control
      e. On/Off/Auto Control

f. Disable/Enable
g. Clear Historical Alarm Log
h. Clear Historical Trouble Log
i. Walk Test
j. Change Alarm Verification

7. Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an (ACK) key with insufficient access, an error message will be displayed. The points will scroll with (ACK) key presses to view the points on the list, but the points will not get acknowledged in the database.

N. RS-232-C Output:
1. Fire alarm control panel shall be capable of operating remote CRTs and/or printers; output shall be ASCII from an EIA RS-232-C connection with an adjustable baud rate.
2. Each RS-232-C port shall be capable of supporting and supervising a remote CRT supporting as many as four (4) remote CRT displays or printers. Data amplifiers shall be used to increase CRT or printer line distance. Each RS-232-C port shall only communicate with one keyboard. The fire alarm control panel shall support up to five (5) RS-232-C ports.

O. Fire Alarm Control System Network:
1. Each fire alarm control panel shall operate as a proprietary local system with data communication to a higher order Central Processing Unit (CPU).
2. The CPU shall monitor all alarms and troubles of each fire alarm control panel.
3. The CPU shall control each fire alarm control panel as listed in this specification.
4. All data communication wiring between the CPU and fire alarm control panel shall be supervised for opens, shorts, and grounds.

P. Equipment Enclosures: Provide cabinets of sufficient size to accommodate the aforementioned equipment. Cabinet shall be equipped with locks and transparent door panel providing freedom from tampering yet allowing full view of the various lights and controls.

2.03 REMOTE ANNUNCIATOR(S) - SIMPLEX TYPE 4603-9101

A. Where shown on the plans, provide and install an LCD annunciator. The annunciator(s) shall have a beige enamel finish and shall communicate to the control panel over one twisted shielded pair of wire and operating power shall be 24 VDC and be fused at the control panel. Point-wired annunciators will not be considered as equal. The LCD display shall mimic the LCD display on the control panel.

B. The serial annunciator shall provide a common alarm and trouble circuit consist of:
1. Control Push-Button Switches - for: alarm silence, trouble silence, system reset, and manual evacuation duplicating the control panel switches. A key "enable" switch shall be provided to activate or deactivate the control switches.
2. Tone Alert - Duplicates the control panel tone alert during alarm and trouble conditions.
3. System trouble English language display.
4. Power on LED.
5. To accommodate and facilitate job site changes, the control switches shall have the capability to be programmed on-site to provide for manual switch input operation other than their standard purpose.

C. Where shown on the plans, provide and install a graphic display annunciator showing building plan. Annunciator LEDs shall show location of alarm and/or trouble conditions graphically. Graphic annunciator building plan drawing will be provided by owner.
1. Annunciator shall indicate each alarm initiating device graphically. Alarm and trouble conditions shall be indicated for each alarm initiating device.
2. Manual control switches shall be provided for the following functions:
a. System reset.
b. Alarm silence.

c. Trouble silence.
d. Manual evacuation.
e. Alarm acknowledge.
f. Trouble acknowledge.
g. Supervisory service acknowledge.
h. Elevator bypass (explanation required).
i. AHU control (explanation required).
j. City disconnect.
k. "Other" (explanation required)

2.04 MULTIPLE ADDRESSABLE PERIPHERAL NETWORK (MAPNET)

A. Communication with addressable devices. The system must provide communication with initiating and control devices individually. All of these devices will be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:
   1. Alarm.
   2. Trouble.
   3. Open.
   4. Short.
   5. Device missing/failed.

B. All addressable devices shall have the capability of being disabled or enabled individually.

C. Up to 127 addressable devices may be multi-dropped from a single pair of wires. Systems that require factory reprogramming to add or delete devices are unacceptable.

D. Format: The communication format must be a completely digital poll/response protocol to allow t-tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol. Systems that do not utilize full digital transmission protocol are not acceptable.

E. Identification of Addressable Devices: Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses, but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t-tapping the addition of an addressable device between existing devices requires reprogramming all existing electrically further devices. The system must verify that proper type device is in place and matches the desired software configuration.

F. Wiring Type, Distances, Survivability, and Configurations: Wiring types will be approved by the equipment manufacturer. Existing wiring will be utilized in retrofit applications. The system shall allow a line distance of up to 2,500 feet to the furthest addressable device on a Class B circuit. (Class A communications will be provided where shown on the drawings. Wire will be so routed to maintain sufficient distance between the forward and return loop as called for by the authority having jurisdiction.) To minimize wire routing and to facilitate future additions, t-tapping of the communications channel will be supported except where Class A wiring is required.

G. Addressable Device Types:
   1. General: The system control panel, must be capable of communicating with the types of addressable devices specified below. Addressable devices will be located as shown on the drawings
   2. TrueAlarm Addressable Detector Bases - Simplex Type 4098-9781: All addressable smoke and heat detector heads as specified below will be pluggable into their bases. The base will contain electronics that communicate the detector status (normal, alarm, trouble) to the control panel over two wires. The same two wires shall also provide power to the

base and detector. Different detector heads (smoke or heat) must be interchangeable. Upon removal of the head, a trouble signal will be transmitted to the control panel.

3. Ionization Detector Heads - Simplex Type 4098-9716, TrueAlarm:
   a. The ionization type detector shall be a plug-in unit which mounts to a twist-lock base and shall be UL listed.
   b. In order to provide stability over wide changes in environmental conditions such as temperature, humidity and pressure, they will be of dual chamber type: one chamber for sampling, one chamber for reference. They will be sealed against rear airflow entry.
   c. There shall be no limit to the number of detectors, stations, or zone adapter modules, which may be activated or "in alarm" simultaneously.
   d. The detector shall fit into a base that is common with both the heat detector and photoelectric type detector and shall be compatible with other addressable detectors, addressable manual stations, and addressable zone adapter modules on the same circuit. The detector shall also fit into a non-addressable base that is capable of being monitored by an addressable zone adapter module.
   e. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness, if field conditions so require.
4. Photoelectric TrueAlarm Sensor - Simplex Type 4098-9701:
   a. The photoelectric type detector shall be a plug-in unit which mounts to a twist-lock base, and shall be UL approved.
   b. The detectors shall be of the solid-state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear airflow entry.
   c. The detector shall fit into a base that is common with both the heat detector and ionization type detector and shall be compatible with other addressable detectors, addressable manual stations, and addressable zone adapter modules on the same circuit. There shall be no limit to the number of detectors or zone adapter modules which may be activated or "in alarm" simultaneously.
5. Addressable Thermal Detector Head - Simplex 4098-9731: Thermal detector heads must be UL listed. They will be a combination rate-of-rise and fixed temperature (135 F) type, automatically restorable.
6. Addressable Pull Stations - Simplex Type 2099-9784:
   a. Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires which also provide power to the pull station. The address will be set on the station. They will be manufactured from high impact red Lexan. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to all system locks. Pull stations will be double action.
   b. The front of the station is to be hinged to a backplate assembly and must be opened with a key to reset the station. The key shall be common with the control panels. Stations which use Allen wrenches or special tools to reset, will not be accepted. The station shall consist of high impact Lexan plastic, red in color.
   c. The addressable manual station shall be capable of field programming of its "address" location on an addressable initiating circuit. The manual station shall be fitted with screw terminals for field wire attachment.
   d. There shall be no limit to the number of stations, detectors or zone adapter modules, which may be activated or "in alarm" simultaneously.
   e. The addressable manual station shall be UL listed.
7. Addressable Photoelectric Duct Detector TrueAlarm - Simplex Type 4098-9702 with 4098-9701 Smoke Sensor:
   a. The detector shall be a non-polarized 24 VDC type which is compatible with the fire alarm panel and obtains its operating power from the supervisory current in the fire alarm detection loop.

b. Detectors shall be of the solid-state photoelectric type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive material shall be used.
c. The detector head shall be directly interchangeable with an ionization detector type. The 24 VDC detector may be reset by actuating the control panel reset switch.
d. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required. Contact between the base and head shall be of the bifurcated type utilizing spring type, self-wiping contacts. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control panel. Detector design shall provide compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.).
e. It shall be possible to alarm the duct housing by using a test switch. Simplex Type 2098-9786 test LED alarm indicator.
f. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.
g. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as-well-as smoke signal verification circuit and an insect screen.
h. Auxiliary SPDT relays and or remote LED alarm indicators and key-operated test stations shall be installed where indicated.

8. Zone Adaptor Module - Simplex Type MAPNET II 2190-9155: Zone adapter modules shall be used for monitoring of water flow, valve tamper, Halon control panels, non-addressable detectors, and for control of evacuation indicating appliances and AHU systems:
   a. An addressable interface module shall be provided for interfacing normally open direct contact devices to an addressable initiating circuit. The device shall be a Simplex Type Zone Adapter Module (ZAM).
   b. ZAMs will be capable of mounting in a standard electric outlet box. ZAMs will include cover plates to allow surface or flush mounting. ZAMs will receive their 24 VDC power from a separate two-wire pair running from an appropriate power supply.
   c. There shall be two types of devices:
   d. For Type 1 above:
      1) For conventional 2-wire smoke detector and/or contact device monitoring with class B or class A wiring supervision.
         (a) This type of addressable device module will provide power to and monitor the status of a zone consisting of conventional 2-wire smoke detectors and/or N/O contact devices as specified elsewhere. The supervision of the zone wiring will be Class A. These ZAMs will communicate the zone's status (normal, alarm, trouble) to the transponder.
      2) For conventional 4-wire smoke detector with Class B wiring supervision - 2190-9158.
         (a) This type of addressable device will provide power to and monitor the contact status of a zone consisting of conventional 4-wire smoke detectors as specified else. The ZAM will provide detector reset capability and a 2-amp fuse to provide over-current power protection for the 4-wire detector. These ZAMs will communicate the zone's status (normal, alarm, trouble) to the transponder.
   e. For Type 2 above:
      1) Zone Adaptor Module - Simplex Type 2190-9161.
         (a) For signals, speakers, fire fighter phone jacks and other device control with Class B or Class A wiring supervision.
         (b) This type of addressable device will provide double-pole, double-throw relay switching that can be used to connect through easily replaceable 2-

amp fuses: a zone of signals to a power source, speakers to an audio source, fire fighter phone jacks to a communications channel, or activate a variety of controlled devices. The module will be available in either a Class B or Class A supervision version. In the Class B version, the wiring will be supervised by an end-of-line device. In the Class A version, the wiring will be looped back and connected to the module to allow continual operation of the controlled devices even if the wiring sustains a single break. Class A devices will be provided. These ZAMs will communicate the supervised wiring status (normal, trouble) to the fire alarm control panel and will receive a command to transfer the relay from the fire alarm control panel.

2) Zone Adaptor Module. For non-supervised control - Simplex Type 2190-9163. This type of addressable device will provide double-pole, double-throw relay switching for loads up to 120 VAC. It will contain easily replaceable 2-amp fuses, one on each common leg of the relay.

f. The ZAM shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the ZAM become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel.

g. The ZAM shall be capable of being programmed for its "address" location on the addressable device initiating circuit. The ZAM shall be compatible with addressable manual stations and addressable detectors on the same addressable initiating circuit.

9. Addressable Device Supervision:

a. All devices shall be supervised for trouble conditions. The system control panel will be capable of displaying the type of trouble condition (open, short, device missing/failed).

b. Should a device fail, it will not hinder the operation of other system devices.

2.05 ONE-WAY VOICE COMMUNICATION

A. Provide one-way voice communication and tone generating capabilities.

B. A central audio control module shall be provided for the necessary alarm message/tone generation, main and remote microphone connections, music inputs, and mixer/pre-amplifier circuits. Continuous supervision shall be provided. Audio outputs shall have individual gain control, Simplex Type 4100-0210.

C. A hand-held, push-to-talk microphone shall be provided recessed within a protective panel-mounted enclosure. The microphone shall be a dynamic communication type with a frequency range of 200 Hz to 4000 Hz and shall be equipped with a self-winding 5-foot coiled cable. An LED indicator shall be provided to indicate microphone push-to-talk button has been pressed and speaker circuits are ready for transmission. Microphone shall be supervised from disconnection, Simplex Type 4100-0204.

D. An audio control switch module shall be furnished to provide manual to the audio functions. These switches and associated LED indicators shall be supervised from disarrangement or failure.

E. Audio power amplifiers shall be furnished with Dual 25W self-contained filtered 24 VDC power supply, transformer, and amplifier monitor circuits. Amplifiers shall provide a 25 VRMS output with a frequency response of 120 Hz to 12,000 Hz. Provide a sufficient quantity of amplifiers to operate all system speakers simultaneously plus ten (10) percent space capacity.

F. In addition, provide at least one back-up amplifier capable of automatically replacing any failed amplifier.

G. Speaker circuits shall be supplied which are capable of supplying audio signals at 25 VRMS supplied by the system amplifiers. Supervision for open, short, or ground fault conditions shall

be provided. Individual and distinct trouble indications shall be provided for each fault. Provide one circuit for each zone or area of distinct communication.

H. Tones: Digitized tones for alarm or auxiliary requirements shall be available. Tone requirements are as follows:
   1. The Slow Whoop shall be a slowly ascending tone from 200 to 830 Hz in 2.5 seconds.
   2. The Wail shall ascent and descent from 600 to 940 Hz.
   3. The Beep shall be a 470 Hz tone. The time duration shall be 0.7 seconds on and 0.7 seconds off.
   4. The Horn shall be a continuous 470 Hz tone.
   5. The Stutter shall be a 470 Hz tone which is on for 100 milliseconds and off for 100 milliseconds.
   6. The Chime shall be a 700 Hz tone with a 1.5 second delay time.
   7. The Coded Horn shall be a 470 Hz tone designed specifically for use on a coded system.
   8. The Hi/Lo shall be a free running tone with a high frequency of 544 Hz and a low frequency of 440 Hz. The "on time" (Hi) shall be 100 milliseconds while the "off time" (Lo) is 400 milliseconds.

I. A pre-recorded digitized voice message capability shall be provided for automatic transmission to building occupants during alarm conditions. Three (3) messages shall be provided, one for alarm, one for testing. This message player shall not rely on a tape or other mechanical means of transmitting the evacuation message. Those systems that do not use tape players must provide a back-up player designed to automatically operate should the primary device jam or otherwise fail to operate. A standard evacuation message shall be provided under this contract; however, the message player must be capable of transmitting a customized message of up to 4 minutes long.
   1. A self-contained speaker will provide testing of the message(s) without disturbing the occupants of the facility.

J. A pre-recorded digitized P.N.I.S. (Positive Non-Interfering Successive) "voice coding" capability shall be provided for automatic transmission to building occupants during alarm conditions. A separate "voice code" shall sound throughout the facility for each zone in alarm condition. Examples of voice messages are as follows:
   1. Doctor Firestone please dial two-three-two.
   2. Doctor Firestone please call five-four-seven.
   3. Code Red three-four-five.

K. A two (2) remote microphone/annunciator command location(s) as shown on the plans shall be provided to duplicate the manual voice transmission capability of the main fire alarm control panel.

L. Should a two-way firefighters telephone system be provided, a method for remote firefighter's telephone patch-in to the one-way voice communication speakers shall be capable. Manual operation shall be controlled at the fire alarm control panel.

M. Automatic Voice Evacuation Sequence:
   1. The audio alarm signal shall consist of an alarm tone for a maximum of 10 seconds followed by automatic pre-selected voice evacuation messages. At the end of each voice evacuation message, the alarm tone shall resume. The alarm tones shall sound until the alarm silence switch at the fire alarm control panel has been operated.
   2. All audio alarm operations (speaker circuit selection and alarm tone/voice message timing variations) shall be activated by the system software so that any required future changes to the evacuation sequence can be facilitated by authorized personnel without any component rewiring.

N. Manual Voice Paging Sequence:
   1. The system shall be configured to allow selective voice paging. Upon activation of any speaker manual control switch, two (2) seconds of tone shall sound over the speakers indicating an impending voice message will occur.

2. If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the preselected speakers.
3. Facility for total building evacuation and paging shall be provided to allow for activation of speakers. This shall be accomplished by the means of an "All Circuit" switch.

O. Alarm Signals:
1. Provide audio/visual units with flush trims and backboxes for all wall mount audio-visual unit locations as shown on the plans.
2. Provide speakers with mounting plates for all locations requiring surface-mounted audio devices only.
3. Provide speakers and visual alarm signals for all locations requiring ceiling-mounted audio-visual alarm signals as shown on the plans.

2.06 TWO-WAY FIRE FIGHTER COMMUNICATION

A. Provide a two-way voice communication system between the central control, emergency phones and emergency phone jacks. All wires between the central control and remote units shall be continuously supervised. Any fault which occurs shall be reported visually and audibly at the central control.

B. A master telephone control module shall be furnished to provide processing of all two-way communication functions. This module shall include an audible sonalert for call and trouble signaling, a trouble silence switch with ringback, a trouble indication and supervising monitor circuit, Simplex Type 4100-0205.

C. A black master telephone handset with flexible-coiled, self-winding 5-foot cord shall be provided and recessed within a protective panel-mounted enclosure at the command center. This enclosure shall also provide mother board locations for the phone control and flasher/busy tone oscillator.

D. Provide one line (talk) circuit for each [floor][corridor (hall)], [elevator cabs][and stairwells]. Line (talk) circuit modules shall be furnished to electrically supervise for shorts, open and grounds of circuit wiring. Each line module shall contain a "call" and "trouble" indication and a two-position switch to enable two-way voice communication between remote and master phones.

E. The fire department communication system shall be capable of handling single or simultaneous conversations with all phone connected into the system. The phone system circuits shall be so designed to prevent static, hum, or other interference for clear, intelligible two-way conversation between all phones of the system.

F. The system shall indicate to the person attempting to use a remote phone, by a beeping busy signal, that the signal is being received at the central control and that the lines are intact. As many as six (6) phones shall be able to be connected into the active conversation at the discretion of the person at the central control.

G. Operation Shall be as Follows:
1. The act of plugging a handset into an emergency phone jack or removal of any phone from its normal hook position shall cause the appropriate phone location LED to flash and a distinctive audible device to sound at the control panel. The subsequent picking up of the master phone and acknowledgment of the proper phone circuit shall silence the pulsing tone and cause the phone location LED to stop flashing and remain on. This action shall couple the remote phone to the master phone to provide direct and private communications.
2. Attempting to use a subsequent phone on the same circuit shall not cause the pulsing tone to activate if any two-way communications are already established. Any new circuits activated shall, however, cause their discrete phone circuit LEDs to flash until acknowledged.
3. The two-way communications system shall provide the capacity to handle simultaneous use of multiple remote phones.

4. The act of unplugging all handsets in use and replacement of all remote phones to their normal hook position and returning all the related circuit acknowledgment switches to the normal position shall cause the restoration of all normal supervisory functions. If any remote phone is not hung up, or unplugged then the appropriate phone zone indicator LED shall flash and the pulsing tone shall resume at the control panel.
5. At the discretion of the person at the control panel, the system shall allow for remote paging from any firefighter's remote phone location via the system speakers as manually selected at the main controls.

H. At remote master telephone/annunciator location[s] shall duplicate the firefighters telephone capability of the main fire alarm control panel.
1. Master telephones shall be capable of communicating to one another or to any remote firefighters phone jack or phone station.

I. Emergency Phone Jacks - Simplex Type 2084-9001:
1. Provide emergency phone jacks as shown on the plans. Each jack shall be mounted on a stainless steel single gang plate with the words "Fire Emergency Phone" screened on each.
2. Provide emergency phone jacks for installation in each elevator car by the elevator contractor. Required wiring from elevator controls to each elevator car shall be furnished and installed by the elevator contractor.

J. Emergency Phone Stations - Simplex Type 2084-9006: Provide remote phones in break rod cabinets for installation where shown on the plans. Emergency phones shall be constructed of red cycolac type T, a thermal ABS material, and be equipped with an armored cable.

K. Emergency Phones - Simplex Type 2084-9014: Provide a minimum of five (5) pluggable emergency phones within a storage cabinet.

2.07 PRINTERS AND/OR CRT'S

A. Where shown on the plans, provide and install a printer and/or CRT. Printer(s) shall receive English language text from the fire alarm control panel in an industry standard ASCII format via an EIA RS-232-C connection.

B. All printed information shall include time and date.

C. Printer shall be quiet operation, with automatic paper take up, and shall receive print messages in the 80 column format but shall print each message on multiple lines. Printer shall have secondary battery standby capability should the primary power source fail.

D. A desktop 80 column printer shall provide a hard copy record of system events. Printer shall support the following features:
1. 120 VAC input power.
2. 180 characters per second.
3. 3 kilobytes buffer capacity.
4. Impact dot matrix.
5. Cartridge type ribbon.
6. Friction feed for cut forms.
7. Tractor feed for continuous 9-1/2" wide pin-to-pin fanfold paper.
8. U.L. 864 listed (UOXX).

E. A desktop CRT (cathode ray tube) with detachable keyboard shall provide an English language display with time and date of system events. CRT shall be a tilt/swivel, 14 inch monitor with capability to display 24 lines of information. Information on the screen shall not scroll off until an acknowledge key is pressed. Display shall be easy-to-read green phosphor, non-glare. CRTs with keyboards shall provide the following functionality:
1. Acknowledgment of alarms, troubles, and supervisory conditions.
2. Alarm silence.
3. System reset.

4. Time and date.
5. Alarm, trouble, and supervisory service condition summary screens.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Provide and install the system in accordance with the plans and specifications, all applicable codes and the manufacturer's recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC article 760 A and C, Power-Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and general contractor.
   1. All junction boxes shall be sprayed red and labeled "Fire Alarm." Wiring color code shall be maintained throughout the installation.

B. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.

C. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.

D. The manufacturer's authorized representative shall provide on-site supervision of installation.

E. All wiring shall be installed in conduit.

3.02 TESTING

A. The completed fire alarm system shall be fully tested in accordance with NFPA-72 by the contractor in the presence of the owner's representative and the local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor.

3.03 WARRANTY

A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.

B. The equipment manufacturer shall make available to the owner a maintenance contract proposal to provide required inspections and tests per year in compliance with NFPA-72, Chapter 14 guidelines.

END OF SECTION 28 3100

SECTION 28 48 20
EMERGENCY RESPONDER RADIO COVERAGE IN BUILDINGS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Building Radio Coverage. Except as otherwise provided no person shall maintain, own, erect, or construct, any building or structure or any part thereof, or cause the same to be done which fails to support adequate radio coverage for public safety entities, including, but not limited to, firefighters, emergency medical services and police officers. "Agency" as used in this code means the local governmental authority enacting this code.
   1. Exceptions:
      a. This section shall not apply to single family residential buildings; any building constructed of wood frame, any building twenty-five (25) feet high or less; as long as none of the aforementioned buildings make primary use of metal or concrete construction or contain below grade storage or parking areas. For purposes of this section, parking structures are included in the definitions of building, and stair 1shafts are included in the definition of all parts of a building, but elevators may be excluded.
      b. Buildings constructed prior to the implementation of this section shall not be required to comply with public safety radio coverage provisions of this restoration, or significant modification to the original structure, exemption from the provisions of this Ordinance shall not apply.

B. Minimum Radio Coverage into building. A minimum voice quality of DAQ 3.4 (see TSB-88-B) (for Digital radio systems) and Circuit Merit 3 (for Analog systems) be present in all areas of the building when transmitted from the agency's radio system. For purposes of this section, 95% building coverage is considered to all areas of the building.

C. Minimum Signal Strength out of building. A minimum signal strength of 20 db ± 5 db above the noise floor shall be provided to and from the agency's radio system when transmitted or received from all areas of the building. For purposes of this section, 95% building coverage is considered to be all areas of the building.

D. Technical criteria maintained by the Agency. The agency shall maintain a document of technical information specific to their requirements. This document shall contain as a minimum; the frequencies required the location and effective radiated power (ERP) of radio sites used by the in-building system, the maximum propagation delay (in microseconds) and other supporting technical information.

E. Amplification Systems Allowed. Buildings and structures which cannot support the required level of radio coverage shall be equipped with a radiating cable system and/or a distributed antenna system (DAS) with FCC certified Bi-Directional Amplifier (BDA)s (AKA: bi-directional amplifiers), or systems otherwise approved by the agency in order to achieve the required adequate radio coverage

F. Battery Systems. The active components of the installed system or systems shall be capable of operating on an independent battery system for a period of at least twelve (4) hours without external power input. The battery system shall automatically charge in the presence of external power input.

G. Bi-Directional Amplifier (BDA) requirements. If used, Bi-Directional Amplifier (BDA)s shall meet the following requirements as well as any other requirements determined by the agency.
   1. All Bi-Directional Amplifier (BDA) components shall be contained in one NEMA4 type waterproof cabinet. Permanent external filters and attachments are not permitted.
   2. The battery system shall be contained in one NEMA4 type water proof cabinet.
   3. The system shall be capable of providing automatic alarming of malfunctions of the Bi-Directional Amplifier (BDA) and battery system. Any resulting alarm shall be transmitted to

the agency's designated recipient by means specified by the agency, including, but not limited to, automatic standard telephone dial-up circuit, TCPAP network circuit, RS232 interface, etc.

4. Products used in such systems must have FCC Certification prior to installation. Pending FCC certification is not acceptable.
5. All Bi-Directional Amplifier (BDA)s must be compatible with both analog and digital communications simultaneously at the time of installation.

H. Additional frequencies and change of frequencies. The building owner will be required to modify or expand the public safety in-building system at their expense in the event frequency changes are required by the FCC or additional frequencies are made available by the FCC. This is an advisory statement that the building owner may select equipment and distribution components that are capable of such changes. Prior approval of an in-building system on previous frequencies does not exempt this section.

I. Approval for Prior to Installation. No amplification system capable of operating on frequencies licensed to the agency by the FCC shall be installed without prior coordination and approval of the agency. This is a FCC requirement.

PART 2 - PRODUCTS

2.01 EQUIPMENT REQUIREMENTS

A. Engineering and Design. The Bi-Directional Amplifier (BDA) system(s) shall be designed by a professionally licensed Engineering Firm with a currently certified electrical engineering professional in its employ.

B. Implementation. The Bi-Directional Amplifier (BDA) system(s) shall only be implemented by professional system integrator certified and trained by the manufacturer of the Bi-Directional Amplifier (BDA).

C. Documentation. As-built drawings consisting of a system block diagram, layout drawings and data settings, shall be provided electronically in AutoCAD format on CD and in paper copies (2) to the agency.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Testing and Proof of Compliance. Each owner shall submit at least one in-building coverage test:

1. Acceptance testing prior to occupancy of any newly constructed building.
2. Whenever structural changes occur including additions to buildings that would materially change the original field performance test.
3. Annually.
4. When repairs or alterations are made to amplification systems, the performance test shall demonstrate that adequate radio coverage is available in all required areas of the building. At the conclusion of the testing a report shall be submitted to the agency which shall verify compliance with Section 1.2.

B. Acceptance Test Procedure. When an in building radio system is required, and upon completion of installation, it will be the building owner's responsibility to have the radio system tested to ensure that two-way coverage on each floor of the building is a minimum of 95 percent.

1. Each floor of the building shall be divided into a grid of approximately 40 equal areas. A maximum of two nonadjacent areas will be allowed to fail the test.
2. In the event that three of the areas fail the test, in order to be more statistically accurate, the floor may be divided into 40 equal areas. A maximum of four nonadjacent areas will be

allowed to fail the test. After the 40-area test, if the system continues to fail, it will be the building owner's responsibility to have the system altered to meet the 95 percent coverage requirement.

3. The test shall be conducted using a calibrated portable radio of the latest brand and model used by the agency talking through the agency's radio communications system.
4. A test location approximately in the center of each grid area will be selected for the test, then the radio will be enabled to verify two-way communications to and from the outside of the building through the agency's radio communications system. Once the test location has been selected, prospecting for a better spot within the grid area will be permitted within 3' in any direction of the original selected test location.
5. Isolation Testing. As part of the installation a spectrum analyzer or other suitable test equipment shall be utilized to insure spurious oscillations are not being generated by the subject Bi-Directional Amplifier (BDA) due to coupling (lack of sufficient isolation) between the input and output antenna systems. The test will be conducted at time of installation and subsequent annual inspections.

C. System Settings. The gain and power values of all Bi-Directional Amplifier (BDA)s shall be measured. The test measurement results shall be recorded on as-built drawings and kept on file with the building owner so that the measurements can be verified each year during the annual tests. In the event that the measurement results become lost, the building owner will be required to rerun the acceptance test to reestablish the gain values.

D. Annual Tests. When an in-building radio system is required, it shall be the building owner's responsibility to have all active components of the system, such as Bi-Directional Amplifier (BDA)s, power supplies and backup batteries test to a minimum of once every twelve (12) months. Bi-Directional Amplifier (BDA)s shall be tested to ensure that the gain and power are the same as it was upon initial installation and acceptance. Backup batteries and power supplies shall be tested under load of a period of one hour to verify that they will properly operate during an actual power outage. If within the one-hour test period, and in the opinion of the agency's representative, the battery exhibits symptoms of failure, the test shall be extended for additional one-hour periods until the integrity of the battery can be determined. All other active components shall be checked to determine that they are operating within the manufacturer’s specifications for the intended purpose.

E. Field Testing. Police and Fire Personnel shall at any time have the right to enter onto the property to conduct its own field-testing to be certain that the required level of radio coverage is present.

F. Minimum qualifications of personnel. The minimum qualifications of the system engineer and integration organization shall include:
   1. A Valid Professional Engineering Certification
   2. Certification of in-building system training issued by the manufacturer of the equipment being installed.

G. Other code compliance. The in-building system installation and components shall comply with all the applicable local codes, including but not limited to, Federal Communications Rules (47CFR 90.219), NEC, NFPA, IBC, TIA/EI

END OF SECTION 28 4820